



MANONMANIAM SUNDARANAR UNIVERSITY
THIRUNELVELI



PG-Course - Affiliated Colleges Course
M.A. TAMIL

(with effect from the academic year 2023 - 2024)

SEMESTER - 1				
		Course Name	Credit	Hour
Part A	Core	T1 இக்கால இலக்கியம்	5	7
		T2 அற இலக்கியம்	5	7
		T3 தொல்காப்பியம் எழுத்த்திகாரம்	4	6
	Elective I	விருப்பப்பாடம் - நாட்டார் வழக்காற்றியல்	3	5
	Elective II	விருப்பப்பாடம் - அயலக தமிழ் இலக்கியம்	3	5
			20	30
SEMESTER - 2				
Part A	Core	T4 பக்தி இலக்கியம்	5	6
		T5 காப்பிய இலக்கியம்	5	6
		T6 சொல்லதிகாரம்	4	6
	Elective III	விருப்பப்பாடம் - உரையாசிரியர்கள்	3	4
	Elective IV	விருப்பப்பாடம் - பண்பாட்டு மானிடவியல்	3	4
Part B	Skill Enhancement	திறன் மேம்பாட்டுப் பாடம் - தகவல் தொடர்பியல்	2	4
			22	30

SEMESTER - 3				
Part A	Core	T7 சிற்றிலக்கியம்	5	6
		T8 தொல்காப்பியம் பொருளதிகாரம் (முன் 5 இயல்)	5	6
		T9 ஆராய்ச்சி நெறிமுறைகள்	5	6
	Core (Industry Module)	T10 அ. படைப்புத்திறன் ஆ. விளம்பரக் கலை	4	6
	Elective V (Discipline- Centric)	விருப்பப்பாடம் - இலக்கிய திறனாய்வும் கொள்கைகளும்	3	3
Part B	Skill Enhancement	திறன் மேம்பாட்டுப் பாடம் - நூலகவியல்	2	3
		Internship/ Industrial Activity	2	-
			26	30
SEMESTER - 4				
Part A	Core	T11 சங்க இலக்கியம்	5	6
		T12 தொல்காப்பியம் பொருளதிகாரம் (பின் 4 இயல்)	5	6
	Project	ஆய்வேடு	7	10
Part B	Elective VI (Industry / Entrepreneurship)	20% Theory 80% Practical	3	4
	Professional Competency skill Enhancement	பணித்தேர்வு தமிழ் /NET/SELT (4 Hours)	2	4
	Extension Activity	களப்பணி	1	-
	TOTAL		23	30
	TOTAL CREDIT		91	

(*குறிப்பு : பெண்ணியம், சமயம் மற்றும் அந்தந்த மாவட்ட மரபு சார்ந்தவைகளுக்கானத் தாள்களை இணைத்துக் கொள்ளலாம்)

விருப்பப்பாடம் - நாட்டார் வழக்காற்றியல்

Course Code	Course Name	Category	L	T	P	S	Credits	Ins.Hrs.	Marks		
									CIA	External	Total
	நாட்டார் வழக்காற்றியல் Folkloristics	Elective	Y	-	-	-	3	5	25	75	100

Pre-requisite	நாட்டார் வழக்காற்றியல் குறித்த பொதுவான அறிவினைப் பெற்றிருத்தல்.	Syllabus Version	R2022
Course Objectives: பாட நோக்கங்கள்			
<ul style="list-style-type: none"> • நாட்டார் வழக்காற்றியல் புலத்தை ஒரு சமூக அறிவியல் புலமாக அறிமுகம் செய்தல். • இப்புலம் தமிழியல் புலத்திற்கு நல்கியுள்ள பங்களிப்பை அறியச் செய்தல் மற்றும் இப்புலத்தின் இன்றைய தேவையை அறிதல். • வாய்மொழி இலக்கியங்கள் குறித்த பரந்த அறிமுகத்தைப் பெறுதல். • நிகழ்த்து கலைகள் குறித்த தெளிவான அறிவைப் பெறுதல். • இதன்வழி மண்ணின் மரபுகளைப் புரிந்து கொள்ளல். 			
Expected Course Outcomes: இப்பாடத்தைக் கற்பதால் விளையும் பயன்கள்			
இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்.			
CO 1.	நாட்டார் வழக்காற்றியல் புலத்தை நன்கறிந்துகொள்ளுதல்	K1,K3	
CO 2.	வாய்மொழி இலக்கியங்கள், நிகழ்த்து கலைகள் குறித்த தெளிவான அறிவினைப் பெறுதல்	K2,K4,K5	
CO 3.	நாட்டார் வழக்காற்றியல் துறையில் ஆய்வுகளை நிகழ்த்தும் அறிவினைப் பெறுதல்.	K2,K4,K5	

CO 4.	மண் சார்ந்த பண்பாட்டு மரபுகளைப் புரிந்துகொண்டு அவற்றை மதிப்பவராக உருப்பெறுதல்.	K2,K3,K4
CO 5.	நாட்டார் வழக்காற்றியல் துறைசார் தரவுகளைச் சேகரிக்கக் கள ஆய்வு நிகழ்த்தும் ஆற்றலைப் பெறுதல்	K4,K5,K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		
Unit:1	புல அறிமுகம்	
<p>நாட்டார் வழக்காற் கலைச்சொற்கள் - கலைச்சொல் சிக்கல்கள் - நாட்டார் வழக்காற்றியல் / நாட்டுப்புறவியல் சொற்கள் குறித்த விவாதங்கள் - நாட்டார் யார்? - வழக்காறு என்றால் என்ன? - நாட்டார் வழக்காற்றியல் வரையறைகள் - எல்லையும் பரப்பும் - நாட்டார் வழக்காற்றியல் புலத்தின் படிநிலைகள்: சேகரித்தல், வகைப்படுத்தல், ஆய்வு - வாய்மொழி வழக்காறுகளின் இயல்புகள் - நாட்டார் வழக்காற்றியல் துறை இலக்கியம், மானிடவியல், மொழியியல், வரலாறு முதலான பல்புலத் தொடர்பு - தமிழியலுக்கு நாட்டார் வழக்காற்றியலின் பங்களிப்பு - நாட்டார் வழக்காற்றியலின் இன்றைய தேவை.</p>		
Unit:2	கள ஆய்வு	
<p>தமிழில் கள ஆய்வு - ஆய்வுக் களமும் தரவுகளும் - களப்பணி அடிப்படைகள் - களப்பணியாளர் - களப்பணிக்குத் தகுதியாதல் - களப்பணி முறைகள் - ஆய்வுக் கருவிகளும் உத்திமுறைகளும் - தரவுகளின் வடிவங்கள் - பால் பாகுபாட்டுச் சிக்கல்கள் - ஒழுக்கம் தொடர்பான சிக்கல்கள் - அடையாளம் - அது குறித்த சிக்கல்கள் - பனுவலாக்கம் - ஆவணகமும் ஆவணப்படுத்தலும்.</p>		
Unit:3	வாய்மொழி இலக்கியங்கள் - 1	
<p>தமிழிலக்கியங்களில் வாய்மொழி இலக்கியங்களின் தாக்கம் - பழமொழிகள் - விளக்கம், வரையறை - தமிழ்ப் பழமொழிகள் சேகரிப்பும் பதிப்பும் - பழமொழியின் இயல்புகள் - இழைவுக் கூறுகள் - பழமொழி விடுகதை மாற்றம் - பழமொழிகளும் கதைகளும் - பழமொழிகளின் செயல்பாடுகள்.</p> <p>விடுகதைகள் - விளக்கம் - கலைச்சொற்கள் - வரையறை - சேகரிப்பும் பதிப்பும் - விடுகதை வகைகள் - விடுகதை அமர்வு - விடுகதைகளின் செயற்பாடுகள்.</p> <p>நாட்டார் கதைகள் - விளக்கம் - வரையறை - வகைகள் - சேகரிப்பும் பதிப்பும் - கருவி வழக்காறுகள் (Metafolklore) - கதைக்கூறு (Motif) - கதை வகை (Tale type) - கதை வகை அடைவும் பயனும் - கதைகளின் செயற்பாடுகள்.</p>		
Unit:4	வாய்மொழி இலக்கியங்கள் - 2	
<p>நாட்டார் பாடல்கள் விளக்கம் - வரையறை - பாடல் வகைகள் - சேகரிப்பும் பதிப்பும் - பாடும் உத்திகள் - தமிழிலக்கியத்தில் நாட்டார் பாடல்களின் செல்வாக்கு அல்லது தாக்கம் - நாட்டார் பாடல்களின் செயல்பாடு - அயலகத் தமிழர்களின் நாட்டார் பாடல்கள்</p>		

<p>கதைப் பாடல்கள் விளக்கம் வரையறை - கதைப்பாடல் இயல்புகள் - கதைப்பாடல் வகைகள் - சேகரிப்பும் பதிப்பும் - வழங்கப்படும் சூழல்கள் - கதைப்பாடல்களின் பயன்கள் - முத்துப்பட்டன் கதை - தமிழ் வாய்மொழி இலக்கிய ஆய்வுகள்: பருந்துப் பார்வை.</p>	
Unit:5	நிகழ்த்து கலைகள்
<p>நாட்டார் நிகழ்த்து கலைகள் - விளக்கம் - வரையறை - வகைகள் - நிகழ்த்தப்படும் சூழல் - நிகழ்த்துநர் - ஒப்பனை - இசைக்கருவிகள் - கரகாட்டம் - கொக்கலிக்கட்டை ஆட்டம் - குறவன் குறத்தி ஆட்டம் - தெருக்கூத்து - உடுக்கடி பாடல் - வில்லுப்பாட்டு - அயலகத் தமிழர் நிகழ்த்து கலைகள்.</p>	
Text Book(s)	
<p>1. நாட்டார் வழக்காற்றியல்: சில அடிப்படைகள், தே. லூர்து, நாட்டார் வழக்காற்றியல் ஆய்வு மையம், பாளையங்கோட்டை, 2000.</p>	
<p>2. தமிழர் கலை இலக்கிய மரபுகள் (நாட்டுப்புறவியல் ஆய்வுகள்), ஆறு இராமநாதன், மெய்யப்பன் பதிப்பகம், சிதம்பரம், 2007.</p>	
<p>3. தமிழில் புதிர்களும் காதலர் விடுகதைகளும், ஆறு. இராமநாதன், மணிவாசகர் பதிப்பகம், சென்னை, 2011.</p>	
<p>4. 'முகவுரை', தமிழர் நாட்டுப் பாடல்கள், தொகுப்பாசிரியர்: நா. வானமாமலை, என்.சி.பி.எச். லிட்., சென்னை, முதற்பதிப்பு, 1964.</p>	
<p>5. முத்துப்பட்டன் கதை, பதிப்பாசிரியர்: நா. வானமாமலை, பதிப்புத்துறை, மதுரை காமராசர் பல்கலைக்கழகம், மதுரை, முதற்பதிப்பு: 1971, நான்காம் பதிப்பு: 2006.</p>	
<p>6. நாட்டுப்புறவியல் கள ஆய்வு நெறிமுறைகள், பொதுப்பதிப்பாசிரியர்: பக்தவச்சல ரெட்டி, பதிப்பாசிரியர்: ஆறு. இராமநாதன், தென்னிந்திய மொழிகளின் நாட்டுப்புறவியல் கழகம், திருவனந்தபுரம், 2003. (விற்பனை உரிமை: மணிவாசகர் பதிப்பகம், சென்னை)</p>	
<p>7. 'முதன்மைப் பதிப்பாசிரியர் முன்னுரை', நாட்டுப்புறக் கதைக் களஞ்சியம். தொகுதி-1, பதிப்பாசிரியர் மற்றும் முதன்மைப் பதிப்பாசிரியர்: ஆறு. இராமநாதன், மெய்யப்பன் பதிப்பகம், சிதம்பரம்.</p>	
<p>8. வாய்மொழிக் கதைகள் (வகைமை, சேகரிப்பு, பனுவலாக்கல்), ஆ. சிவசுப்பிரமணியன், என்.சி.பி.எச், சென்னை, 2019.</p>	
<p>9. 'முதன்மைப் பதிப்பாசிரியர் முன்னுரை', நாட்டுப்புறப் பாடல் களஞ்சியம். தொகுதி-1, பதிப்பாசிரியர் மற்றும் முதன்மைப் பதிப்பாசிரியர்: ஆறு. இராமநாதன், மெய்யப்பன் தமிழாய்வகம், சிதம்பரம், 2001.</p>	
<p>10. நாட்டுப்புறக் கலைகள் - நிகழ்த்துகலைகள், ஆறு இராமநாதன், மெய்யப்பன் தமிழாய்வகம், சிதம்பரம், 2010.</p>	

Reference Books
<ul style="list-style-type: none"> தமிழர் நாட்டுப்புறவியல் களஞ்சியம், பாலசுந்தரம் இளையதம்பி, சுவாமி விபுலாநந்தர் தமிழியல் ஆய்வு மையம், ரொறன்ரோ 2019 (கிடைக்குமிடம்: மணிமேகலை பிரசுரம், சென்னை)
<ul style="list-style-type: none"> நாட்டாரியல் ஆய்வு வழிகாட்டி, அ.கா. பெருமாள், ரோகிணி பிரின்டர்ஸ், நாகர்கோயில், 1985.
<ul style="list-style-type: none"> தமிழ்ப் பழமொழிகள்: அமைப்பு, பொருண்மை, செயல்பாடு, தே. லுர்து, யுனைடெட் ரைட்டர்ஸ், சென்னை, 2007.
<ul style="list-style-type: none"> இலங்கை கிராமத்து முஸ்லிம்களின் பழமொழிகள், எஸ். முத்துமீரான், நேஷனல் பப்ளிஷர்ஸ், சென்னை, 2005.
<ul style="list-style-type: none"> தமிழ்ச் சமூகத்தில் வாய்மொழிக் கதைகள், ஞா. ஸ்டீபன், பாவை பப்ளிகேஷன்ஸ், சென்னை, 2009.
<ul style="list-style-type: none"> சுண்ணாம்பு கேட்ட இசக்கி, அ.கா. பெருமாள், யுனைடெட் ரைட்டர்ஸ், சென்னை முதற்பதிப்பு: 2006.
<ul style="list-style-type: none"> தமிழக நாட்டுப்புறப் பாடல்கள், சு. சண்முகசுந்தரம், பூம்புகார் பிரசுரம், சென்னை, முதற்பதிப்பு: 1978.
<ul style="list-style-type: none"> மலேசிய நாட்டுப்புறப்பாடல்கள், இரா. தண்டாயுதம், தமிழ்ப் புத்தகாலயம், சென்னை, 1998.
<ul style="list-style-type: none"> Ballad Poetry, M. Arunachalam, Gandhi Vidyalayam, Thiruchitrambalam, 1976.
<ul style="list-style-type: none"> துடியான சாமிகள் - வில்லுப்பாட்டும் சமூகச் சிக்கல்களும், நா. இராமச்சந்திரன், என்.சி.பி.எச்., சென்னை, 2015.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
Web Sources
<ul style="list-style-type: none"> Tamil Heritage Foundation- www.tamilheritage.org <http://www.tamilheritage.org> Tamil virtual University Library- www.tamilvu.org/library http://www.virtualvu.org/library Project Madurai - www.projectmadurai.org. Chennai Library- www.chennailibrary.com <http://www.chennailibrary.com>. Tamil Universal Digital Library- www.ulib.prg <http://www.ulib.prg>. Tamil E-Books Downloads- tamilebooksdownloads.blogspot.com Tamil Books on line- books.tamilcube.com Catalogue of the Tamil books in the Library of British Congress archive.org Tamil novels on line - books.tamilcube.com

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CLO1	3	3	2	3	2	3	3	3	2	3	3	3
CLO2	3	2	3	2	3	3	3	2	3	2	3	3
CLO3	2	3	3	3	2	3	2	3	2	3	2	3
CLO4	3	3	3	2	3	2	3	2	3	2	3	3
CLO5	3	3	2	3	3	2	2	3	2	3	3	3

விருப்பப்பாடம் - அயலக தமிழ் இலக்கியம்

Course Code	Course Name	Category	L	T	P	S	Credits	Ins.Hrs.	Marks		
									CIA	External	Total
	அயலக தமிழ் இலக்கியம் Overseas Tamil Literature	Elective	Y	-	-	-	3	5	25	75	100

Pre-requisite	அயல்நாடுகளில் வாழும் தமிழர் குறித்தும் அயல்நாட்டுத் தமிழர்களால் படைக்கப்படும் தமிழ் இலக்கியங்கள் குறித்தும் அறிமுகம் பெற்றிருத்தல்.	Syllabus Version	R2022
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Course Objectives: பாட நோக்கங்கள்

- அயல்நாடுகளில் தமிழர்கள் - இலங்கையில் தொல்குடியாக வாழும் நிலை - ஆங்கிலேயர் ஆட்சிக்காலத்தில் தோட்டத் தொழிலாளர்கள் முதலியோராகப் புலம்பெயர்ந்து இலங்கை மலையகம், மலேசியா, சிங்கப்பூர் முதலிய நாடுகளில் வாழ்தல் - போர்ச்சுழலால் இலங்கையிலிருந்து புலம்பெயர்ந்து வாழ்தல் - கல்வி வேலைவாய்ப்பு நோக்கில் அயல்நாடுகளில் வாழ்தல் - அயல்நாடுகளில் தமிழ்க் கல்வி, தமிழ் ஆய்வு தமிழ் இலக்கியம் தோற்றமும் வளர்ச்சியும் - குறித்து அறிதல்.
- உலகளாவிய நிலையில் இன்று தமிழிலக்கியம் பன்முகப் பரிமாணங்களோடு படைக்கப்பட்டு வரும் நிலையினை அறிதல்.
- தமிழர்கள் தொல்குடியாக ஈழத்தில் விளங்கிய வரலாற்றையும் ஈழத்தமிழிலக்கியத்தின் வரலாற்றையும் வளத்தையும் வகைகளையும் தனித்தன்மைகளையும் அறிதல்.
- தமிழர்கள் மலேசியாவிற்கும் சிங்கப்பூருக்கும் புலம்பெயர்ந்த வரலாற்றையும் மலேசிய, சிங்கப்பூர்த் தமிழிலக்கியத்தையும் குறித்து அறிதல்.
- உலகளாவிய நிலையில் தமிழர்கள் புலம்பெயர்ந்த வரலாறு - தொழிலாளர்களாகப் புலம்பெயர்ந்தமை - போரால் புலம்பெயர்ந்தமை - புலம்பெயர்ந்த தமிழர்கள் படைத்த இலக்கியங்கள் - வகைகள், வளம் - வாழ்க்கைத் துயரும் நெருக்கடிகளும் புதிய நிலச்சூழல்களும் இலக்கியப் பதிவாதல் - இலக்கியத் தகுதிப்பாடு முதலியவற்றைப் பயிலல்.

Expected Course Outcomes: இப்பாடத்தைக் கற்பதால் விளையும் பயன்கள்

இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்.

CO 1.	உலகளாவிய நிலையில் தொல்குடி நிலையிலும் புலம்பெயர்ந்த நிலையிலும் தமிழர்கள் விளங்குதலை அறிதல்.	K1,K2
CO 2.	ஈழத் தமிழ் இலக்கியம், மலையக இலக்கியம் ஆகியவற்றின் வரலாற்றையும் வளர்ச்சியையும் அறிதல்; இவ்விலக்கியங்களின் தனித்தன்மைகளையும் இலக்கியத்	K3,K4

	தகைமையையும் சமூகப் பிரதிபலிப்புகளையும் அறிதல்; வகை மாதிரியாக இலக்கியங்கள் பயிலல்.	
CO 3.	மலேசியா, சிங்கப்பூர்த் தமிழ் இலக்கியங்கள் குறித்து அறிதல்; வகை மாதிரியாக இலக்கியங்கள் பயிலல்.	K4,K5
CO 4.	புலம்பெயர்வும் இலக்கியங்களும் குறித்து ஆழமாக அறிதல். ஈழத் தமிழர் புலம்பெயர்வின் விளைவாகப் படைக்கப்பட்டுள்ள இலக்கியங்களைக் குறித்து உணர்தல்.	K5
CO 5.	அயல்நாடுகளில் தோற்றம் பெற்றுள்ள தமிழ் இலக்கிய வகைகள், வளம், இலக்கிய நலன்கள், புலம்பெயர்வின் வலி, வலிக்கிடையிலும் இலக்கியத்தில் தமிழர்கள் புரிந்துள்ள தலைசிறந்த இலக்கிய ஆக்கங்கள் முதலியன குறித்து ஆழமாக அறிதல்.	K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		
Unit:1	உலகளாவிய நிலையில் தமிழ் இலக்கியம்	
<p>உலகளாவிய நிலையில் தமிழும் தமிழர்களும் - அயல்நாடுகளில் தமிழ்க்கல்வி - தமிழ் இலக்கியம் - தமிழ் ஆய்வு - இலங்கை, மலேசியா, சிங்கப்பூர் முதலிய நாடுகளில் தமிழின் நிலை - அறிமுகம் .</p> <p>பாடநூல்: பாடநூல்: 1. தாயகம் கடந்த தமிழ் - நூலிலிருந்து ஐந்து கட்டுரைகள் மட்டும் (கயல் பருகிய கடல் - மாலன், உலகளாவிய தமிழ் இலக்கியம் - ரெ. கார்த்திகேசு, ஐரோப்பிய அமெரிக்க தமிழ் இலக்கியம் - நாகரத்தினம் கிருஷ்ணா, மலேசியத் தமிழ் இலக்கியப் படைப்புலகம் - கிருஷ்ணன் மணியம், சிங்கப்பூர்த் தமிழ் இலக்கியம் ஓர் அறிமுகம் - சீதா லட்சுமி)</p>		
Unit:2	இலங்கையில் தமிழ் இலக்கியம்	
<p>ஈழத் தமிழ் இலக்கியம் - கவிதை, சிறுகதை, புதினம் முதலியன - இதழ் முயற்சிகள் - மலையகத் தமிழ் இலக்கியம் - கவிதை, சிறுகதை, புதினம் முதலியன - அறிமுகம்</p> <p>பாடநூல்கள்:</p> <p>1. இருபதாம் நூற்றாண்டு ஈழத்துத் தமிழ் இலக்கியம் - நூலிலிருந்து கவிதை, நாவல், சிறுகதை என்னும் தலைப்புடைய பகுதிகள் மட்டும் (பக்க எண்: 18 - 75)</p> <p>2. கவிதை: ஈழத்துக் கவிதைக் கனிகள், தொகுப்பு: சிலோன் விஜயேந்திரன் (ஈசனுவக்கும் மலர் - சுவாமி விபுலானந்தர், தமிழ்க் கவிப் பித்து - க. சச்சிதானந்தன், உள்ளமிசைக்குது காவியம் - ராஜ பாரதி, இதோ கவிதை! - இ. முருகையன், நெருப்புப் பழம் - காசி. ஆனந்தன், பாதி நாடெங்களுக்காக என்று எழுகவே! - மகாகவி, கடல் நடுவே ஒரு களம் - பிருமிள் சிவராம், புத்தரின் படுகொலை - எம்.ஏ. நுஃமான், பூமி புத்திரர் - வ.ஐ.ச. ஜெயபாலன், இரண்டாவது சூரிய உதயம் - சேரன், விழிப்பு - சன்மார்க்கா, இன்று நான் பெரிய பெண் - அ. சங்கரி.)</p>		

அயலகத் தமிழ் இலக்கியம் - தொகுப்பு: சா. கந்தசாமி - கதைகள்: சக்கரவாகம் - இலங்கையர்கோன், வ.அ. இராசரத்தினம், கொடும்பாவி -

4. கட்டுரை: இலங்கையின் மலையகத் தமிழ் இலக்கியம் - க. அருணாசலம்

பிந்தைய இலக்கிய வளர்ச்சியை இணையதளப் பதிவுகள், கட்டுரைகள், நூல்கள்வழிப் பொதுநிலையில் அறிமுகம் செய்தல் (தேர்வுக்கு வினாக்கள் இப்பகுதியிலிருந்து கேட்கப்படவேண்டியதில்லை)

Unit:3 மலேசியாவில் தமிழ் இலக்கியம்

மலேசியத் தமிழர் வரலாறு, மலேசியத் தமிழ் எழுத்தாளர்களின் கவிதைகள் - சிறுகதைகள் - புதினங்கள் - மலேசியத் தமிழ்ச் சமூகத்தின் பிரதிபலிப்புகள் - இதழ் முயற்சிகள்.

மலேசியத் தமிழ்ச் சமூகத்தின் பிரதிபலிப்புகள் - இதழ் முயற்சிகள். கவிதைக் களஞ்சியம் - தொகுப்பு: முரசு. நெடுமாறன் - பாடல் எண்கள் - 1, 8, 18, 65, 66, 74, 93, 104, 129, 131, 135, 138.

2. அயலகத் தமிழ் இலக்கியம் - தொகுப்பு: சா. கந்தசாமி - கதைகள்: 1. வெடித்த துப்பாக்கிகள் - சை. பீர் முகமது, 2. மாணிக்கம் காணாமல் போகிறான் - ரெ. கார்த்திகேசு.

மலேசியத் தமிழிலக்கியத்தின் அண்மைக்காலப் போக்குகள், கோ. புண்ணியவான் எழுதிய கையறு புதினம் உள்ளிட்ட முயற்சிகளைப் பார்வைநூல்களில் உள்ள கட்டுரைகள் வாயிலாகவும் இணையதளப் பதிவுகள் வாயிலாகவும் அறிமுகம் செய்தல்.

Unit:4 சிங்கப்பூரில் தமிழிலக்கியம்

சிங்கப்பூர் தமிழ் எழுத்தாளர்களின் கவிதைகள் - சிறுகதைகள் - புதினங்கள் - சிங்கப்பூர் தமிழ்ச் சமூகத்தின் பிரதிபலிப்புகள் - இதழ் முயற்சிகள்.

பாடநூல்: சிங்கப்பூர்ப் பொன்விழாச் சிறுகதைகள் - நூலிலிருந்து நான்கு கதைகள்: 1. கைம்மாறு - மா. அன்பழகன், 2. முறை மாப்பிள்ளை - க.து.மு. இக்பால், 3. சிகிச்சை - ஜே.எம். சாலி, 4. மூடிய கதவுக்குள்ளே - இலட்சுமி.

Unit:5 புலம்பெயர்வும் இலக்கியங்களும்

உலகெங்கும் புலம்பெயர்ந்த தமிழர்கள் (இலங்கை, மலேசியா, சிங்கப்பூர், பிரான்சு, ஆஸ்திரேலியா, கனடா, பர்மா, அமெரிக்கா, இங்கிலாந்து முதலிய நாடுகளில்...) - தோட்டத் தொழிலாளர்களாகப் புலம்பெயர்ந்தமை - போரால் புலம்பெயர்ந்தமை - பிற சூழல்களால், காரணங்களால் புலம்பெயர்ந்தமை - இவற்றின் விளைவாகத் தோன்றிய கவிதை, சிறுகதை, புதினம், நாடகம் முதலிய வடிவங்கள் - அலைந்துழல்வை ஒட்டியும் புதிய நிலச்சூழல்களை ஒட்டியும் தமிழிலக்கியங்கள் பெற்றுள்ள புதிய பரிமாணங்கள்.

பாடநூல்/பாடப்பகுதிகள்:

1. புலம்பெயர்ந்தோர் இலக்கியம் பனுவல்களும் மதிப்பீடுகளும் - பா. ஆனந்தகுமார்
2. கோகிலம் சுப்பையா, ப. சிங்காரம், சை. பீர்முகம்மது, தொ. பத்திநாதன், ஏ.சி. விஜிதரன், சுகன்யா ஞானசூரி, கனகலதா, கோ. புண்ணியவான், ரெ. கார்த்திகேசு, பொ. கருணாகரமூர்த்தி, றஞ்சினி, கலாமோகன், ஷோபாசக்தி, இராஜேஸ்வரி பாலசுப்பிரமணியம், இணைய அப்துல்லா, ஆழியாள், ஆசி. கந்தராஜா, ஜெயக்குமாரன் சந்திரசேகரம், அ. முத்துலிங்கம், சுமதி ரூபன், வ.ந. கிரிதரன், திருமாவளவன், செல்வம் அருளானந்தம், பா.அ. ஜயகரன், தேவகாந்தன், சேரன் முதலியோர் பங்களிப்புகளை அறிமுகம் செய்தல் (ஆசிரியர்கள் இணையதளங்களைப் பயன்படுத்தி மாணவர்களுக்கு இப்பகுதியைக் கற்பிக்கலாம். இப்பகுதியிலிருந்து தேர்வுக்கு வினாக்கள் கேட்கத் தேவையில்லை)

Text Book(s)

1.	ஈழத்துக் கவிமலர்கள், தொகுப்பாசிரியர்: கனக. செந்திநாதன், வெளியீடு: பராசக்தி நிலையம் - குரும்பசிட்டி - தெல்லிப்பழை, முதல் வெளியீடு: 1962.
2.	ஈழத்துக் கவிதை நயம், சிலோன் விஜயேந்திரன், சைவ சித்தாந்த நூற்பதிப்புக் கழகம், சென்னை, 2002.
3.	தாயகம் கடந்த தமிழ், பதிப்பாசிரியர்: நல்ல பழனிசாமி, தொகுப்பு: மாலன், வெளியீடு: தமிழ்ப் பண்பாட்டு மையம், கோயம்புத்தூர், முதற்பதிப்பு: 2014.
4.	அயலகத் தமிழ் இலக்கியம், தொகுப்பாசிரியர்: சா. கந்தசாமி, சாகித்திய அகாதெமி, புது தில்லி, இரண்டாம் பதிப்பு: 2016.
5.	இருபதாம் நூற்றாண்டு ஈழத்துத் தமிழ் இலக்கியம், சி. மௌனகுரு, மௌ. சித்திரலேகா, எம்.ஏ. நுஸ்மான், வெளியீடு: வாசகர் வங்கம், 'நூறி மன்ஸில்', கல்முனை, இலங்கை, முதற்பதிப்பு: 1979.
6.	மலேசியத் தமிழ்க் கவிதைக் களஞ்சியம், தலைமைத் தொகுப்பாசிரியர்: முரசு. நெடுமாறன், தலைமைப் பதிப்பாசிரியர்: இராம. சுப்பிரமணியன், அருள்மதியம் பதிப்பகம், மலேசியா, முதற்பதிப்பு: 1997.
7.	சிங்கப்பூர்ப் பொன்விழாச் சிறுகதைகள், தொகுப்பாசிரியர்கள்: இரா. துரைமாணிக்கம், இராம. வயிரவன், மாதங்கி, கோல. இளங்கோவன், கிருத்திகா, வெளியீடு: சிங்கப்பூர்த் தமிழ் எழுத்தாளர் கழகம், சிங்கப்பூர், முதற்பதிப்பு: 2015.
8.	புலம்பெயர்ந்தோர் இலக்கியம் பனுவல்களும் மதிப்பீடுகளும், பா. ஆனந்தகுமார், நியூசெஞ்சுரி புக் ஹவுஸ், சென்னை, 2018.
9.	புலம்பெயர்ந்தோர் கவிதைகள், தொகுப்பு: ப. திருநாவுக்கரசு, நிழல் பதிப்பகம், சென்னை, 2001.

Reference Books	
1.	இலங்கையின் மலையகத் தமிழ் இலக்கியம், க. அருணாசலம், தமிழ் மன்றம், ராஜகிரியா, இலங்கை, முதற்பதிப்பு: 1994.
2.	அயல் நாடுகளில் தமிழர், எஸ். நாகராஜன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், முதற்பதிப்பு: 1989.
3.	உலக நாடுகளில் தமிழ்ப் பண்பாடு, எஸ். நாகராசன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், முதற்பதிப்பு: 2004.
4.	உலகத் தமிழ், பதிப்பாசிரியர்: தமிழண்ணல், பதிப்புத்துறை, மதுரை காமராசர் பல்கலைக்கழகம், மதுரை, 1981.
5.	புவியெங்கும் தமிழ்க் கவிதை, தேர்வும் தொகுப்பும்: மாலன், சாகித்திய அகாதெமி, சென்னை, முதற்பதிப்பு: 2019.
6.	இலங்கையில் இன்பத் தமிழ், கா.பொ. இரத்தினம், கலைவாணி புத்தக நிலையம், கண்டி, இலங்கை, முதற்பதிப்பு: 1956.
7.	ஈழத்தில் தமிழ் இலக்கியம், கார்த்திகேசு சிவத்தம்பி, தமிழ்ப் புத்தகாலயம், சென்னை, முதற்பதிப்பு: 1978.
8.	ஈழத்து இலக்கிய வளர்ச்சி, கனக-செந்திநாதன், அரசு வெளியீடு, கொழும்பு, இலங்கை, முதற்பதிப்பு: 1964.
9.	ஈழத்துக் கவிதைக் கனிகள், தொகுப்பாசிரியர்: சிலோன் விஜயேந்திரன், பாரி நிலையம், சென்னை, முதற்பதிப்பு: 1991.
10.	மஹாகவியின் குறும்பா, அரசு வெளியீடு, கொழும்பு, இலங்கை, முதற்பதிப்பு: 1966.
11.	அயல்நாட்டுத் தமிழ் இலக்கியங்கள் (தொகுதி 1), பதிப்பாசிரியர்கள்: கோ. விசயராகவன், மு. வளர்மதி, கு. சிதம்பரம், து. ஜானகி, உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, முதற்பதிப்பு: 2012.
12.	அயல்நாட்டுத் தமிழ் இலக்கியங்கள் (தொகுதி 2), பதிப்பாசிரியர்கள்: கோ. விசயராகவன், மு. வளர்மதி, கு. சிதம்பரம், து. ஜானகி, உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, முதற்பதிப்பு: 2013.
13.	அயலகத் தமிழ்க்கலை, இலக்கியம் சமகாலச் செல்நெறிகள், பதிப்பாசிரியர்: ந. கடிகாசலம், ச. சிவகாமி, உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, முதற்பதிப்பு: 2001.
14.	சிங்கப்பூர், மலேசியத் தமிழ் இலக்கியம் (கருத்தரங்கக் கட்டுரைகள்), பதிப்பாசிரியர்கள்: ஆ. கார்த்திகேயன், சா. உதயசூரியன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், முதற்பதிப்பு: 2010.
15.	மலேசியத் தமிழரும் தமிழும், முரசு. நெடுமாறன், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, முதற்பதிப்பு: 2007.

16.	மலாயா தமிழர் சரித்திரம், இரா. குறிஞ்சிவேந்தன், நியூ செஞ்சரி புக் ஹவுஸ், சென்னை, முதற்பதிப்பு: 2016.
17.	கையறு, கோ. புண்ணியவான், யாவரும் பப்ளிஷர்ஸ், சென்னை, முதற்பதிப்பு: 2020.
18.	இலங்கையின் மலையகத் தமிழ் நாவல்கள் - ஓர் அறிமுகம், க. அருணாசலம், குமரன் புத்தக இல்லம், கொழும்பு-சென்னை, 1999.
19.	ஈழத்து நவீன கவிதை, செ. யோகராசா, குமரன் புத்தக இல்லம், 2007.
20.	இலங்கை மலையகத் தமிழ் இலக்கிய முயற்சிகள், சாரல் நாடன், குமரன் புத்தக இல்லம், 2014.
21.	ஈழத்து வாழ்வு வளமும், க. கணபதிப் பிள்ளை, பாரி நிலையம், சென்னை, முதற்பதிப்பு: 1962.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

- Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>>
- Tamil virtual University Library- www.tamilvu.org/library <http://www.virtualvu.org/library>
- Project Madurai - www.projectmadurai.org.
- Chennai Library- www.chennailibrary.com <<http://www.chennailibrary.com>>.
- Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
- Tamil E-Books Downloads- tamilebooksdownloads.blogspot.com
- Tamil Books on line- books.tamilcube.com
- Catalogue of the Tamil books in the Library of British Congress archive.org

Tamil novels on line - books.tamilcube.com

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CLO1	3	2	1	3	3	2	3	2	1	3	3	2
CLO2	3	3	2		2	3	3	2		2	3	3
CLO3	2	3	2	3	3	3	2	3	2	3	2	3
CLO4	3	2	3	2	3	3	3	2	1	3	3	2
CLO5	3	2	3	3	3	2		2	3	3	3	3

விருப்பப்பாடம் - உரையாசிரியர்கள்

Course Code	Course Name	Category	L	T	P	S	Credits	Ins.Hrs.	Marks		
									CIA	External	Total
	உரையாசிரியர்கள்	Elective	Y	-	-	-	3	4	25	75	100

Pre-Requisite	மாணவர்கள் பண்டைய மரபிலக்கணங்களுக்கான உரைகள் பற்றி அறிந்திருதல் நலம்.		
Learning Objectives			
The Main Objectives of this Course are to :			
<ul style="list-style-type: none"> • இலக்கிய, இலக்கண உரையாசிரியர்களின் ஆராய்ச்சி வரலாற்றினை அறிந்து கொள்ளுதல். • உரையாசிரியர்களின் உரைகளுக்கு இடையிலான வேறுபாட்டினைக் கண்டறிதல் • இலக்கிய, இலக்கணத்திற்குப் புதிய உரை எழுதுவதற்கான திறன் பெற்று எழுதுதல் 			
Expected Course Outcomes			
On the Successful completion of the Course, Students will be able to			
இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர்கள் அடைவர்			
CO 1	மரபிலக்கணங்களுக்கு எழுதப்பட்டுள்ள உரைகளின் இன்றியமையமையும், உரைவகைகளையும், உரைத் திறன்களையும் மாணவர்கள் அறிந்திருவர்.		K2
CO 2	ஐவகை, அறுவகை இலக்கண உரையாசிரியர்கள், பாட்டியல் இலக்கண நூல்களுக்கு உரை எழுதியோர், தற்கால உரையாசிரியர்கள் ஆகியோர்களின் பங்களிப்புகளை மாணவர்கள் அறிந்துகொள்வர்.		K2
CO 3	பல்வேறு உரையாசிரியர்களின் உரைப்போக்குகளை ஒப்பிட்டு நோக்கும் திறனை மாணவர்கள் பெறுவர்		K4
CO 4	இலக்கண, இலக்கிய உரைகளுக்கிடையிலான வேறுபாடுகளைப் பகுத்தறியும் திறன் பெறுவர்		K5

CO 5	சமய இலக்கிய உரைகளின் மொழிநடைகளை அறிந்து கொள்வதன்வழிப் பிறமொழிக் கலப்பின்றித் தனித்தமிழ் நடையில் எழுதும் திறன் பெறுவர்	K3
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		
Unit -I	உரை - பொது விளக்கம் உரை வரையறை -விளக்கம் - உரை வகைகள் - இலக்கண, இலக்கிய உரைகள் - அதன் உள் வகைகள்	
Unit -II	இலக்கண உரைகள் வகைமை அடிப்படையில் உரையாசிரியர் - ஐவகை இலக்கண உரைகள்- நூல் அடிப்படையில் உரை- தொல்காப்பியம், நன்னூல் முதலாக இலக்கண உரைகளுக்கு இடையே உள்ள பொதுத்தன்மைகள்- இலக்கண உரை வரலாறு	
Unit -III	இலக்கிய உரைகள் வகைமை அடிப்படையில் உரைகள்- சங்க இலக்கியம் -அற இலக்கியம்- காப்பியம் -புராணம் -பக்தி, சிற்றிலக்கிய உரைகள்- சமய இலக்கிய உரைகள்- நூல் அடிப்படை வகை -புறநானூறு, சிலப்பதிகாரம் ,திருக்குறள் முதலான உரைகள் தத்துவ உரைகள்	
Unit -IV	உரை ஆய்வுகள் உரைவளம், உரைக்கொத்து, தொகுப்புரைகள் -மதிப்பீடுகள் -உரையின் வரலாற்றுப் பின்னணி -உரையாசிரியரின் பல உரைகள் பற்றிய ஆய்வு வரலாறு- உரைகளைப் பற்றி ஆராய்ந்தவர்கள்	
Unit -V	உரை ஆளுமைகள் தனித்தன்மைகள் இலக்கண உரையாசிரியர்கள் - இலக்கிய உரையாசிரியர்கள்	
Text books		
	உரையாசிரியர்கள், அரவிந்தன் மு .வை. ,மணிவாசகர் பதிப்பகம் ,சென்னை -2002	
	உரை மரபுகள், மோகன் இரா. சொக்கலிங்கம் , மெய்யப்பன் பதிப்பகம், சென்னை- 2003	
Reference Books		
	அடியார்க்குநல்லார் உரைத்திறன் , சுப்பிரமணியன் ச. வே. மெய்யப்பன் பதிப்பகம் ,சிதம்பரம் -2006	

	,நம் பிள்ளை உரைத்திறன் , அரங்கராஜன் .இரா. திருவாய்மொழிப் பேருரையாளர் மெய்யப்பன் தமிழாய்வகம், சிதம்பரம் -2002
	ஈழத்து தமிழ் உரைமரபு , சிவலிங்கராஜா .எஸ் ,குமரன் புத்தக இல்லம் ,சென்னை- 2003

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]												
Web Sources												
<ul style="list-style-type: none"> Tamil Heritage Foundation- www.tamilheritage.org <http://www.tamilheritage.org> Tamil virtual University Library- www.tamilvu.org/ library http://www.virtualvu.org/library Project Madurai - www.projectmadurai.org. Chennai Library- www.chennailibrary.com <http://www.chennailibrary.com>. Tamil Universal Digital Library- www.ulib.prg <http://www.ulib.prg>. Tamil E-Books Downloads- tamilebooksdownloads. blogspot.com Tamil Books on line- books.tamil cube.com Catalogue of the Tamil books in the Library of British Congress archive.org 												
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2
CLO1	3	2	3	2	3	3	2	3	2	3	3	2
CLO2	3	2	1	3	3	2	3	3	2	1	3	3
CLO3	3	3	2	1	3	3	2	3	2	2	3	3
CLO4	2	3	3	2	3	2	3	3	2	3	2	3
CLO5	3	2	3	2	3	3	3	2	3	2	3	2
<ul style="list-style-type: none"> Tamil novels on line - books.tamilcube.com 												

Strong -3,Medium-2,Low-1

விருப்பப்பாடம் - பண்பாட்டு மானிடவியல்

Course Code	Course Name	Category	L	T	P	S	Credits	Ins.Hrs.	Marks		
									CIA	External	Total
	பண்பாட்டு மானிடவியல்	Elective	Y	-	-	-	3	4	25	75	100

Pre-Requisite	பழந்தமிழரின் வாழ்வியலை அறிந்திருத்தல்	R2022	
Learning Objectives			
<ul style="list-style-type: none"> • மானிடவியலை அறிமுகப்படுத்துதல் • உடல்சார் பண்பாட்டு மானிடவியலை அறிமுகம் செய்தல். • பண்பாட்டின் உட்கூறுகளை விளக்குதல். • .பண்பாட்டு மாற்றத்தின் முறைகளைக் கற்பித்தல். • திருமணம், உறவு முறைகளை இயம்புதல். 			
Expected Course Outcomes			
On the Successful completion of the Course, Students will be able to			
இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்			
CO 1	மானிடவியல் துறையை மாணாக்கர் அறிந்து கொள்வர்.	K4,k2	
CO 2	தமிழகப் பண்பாட்டு மாற்றம் குறித்து மாணவர்கள் அறிவர்	K5, K6	
CO 3	பிற சமயத் தழுவுதல் குறித்து விரிவாகத் தெரிந்துக் கொள்வர்.	K3,k1	
CO 4	பழந்தமிழரின் சமூக நிலை, பண்பாட்டு நிலை, உயிரியல் நிலை போன்றவற்றை தற்கால வாழ்வியலுடன் பொருத்திப் பார்த்தல்	K3,k4	

CO 5	தமிழ் ஆய்விலும் பிற துறையை ஆய்வு செய்யும் நோக்கை அறிந்து கொள்வர்	K2,K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		
Unit -I	மானிடவியலின் தோற்றம் அரிஸ்டாட்டிலின் கொள்கை மானிடவியலின் உலகம் தழுவிய வளர்ச்சி	
Unit -II	மானிடவியல் பிரிகளின் அறிமுகம் - உடல் சார் மானிடவியல் பண்பாட்டு மானிடவியல் தொல்லியல் - மொழியியல்,	
Unit -III	சாதிமுறை - சாதி முறையின் வகைகள் - இந்தியச் சாதிமுறை - சாதிக் கொள்கைகள் - மரபுக் கொள்கை - தொழிற்கொள்கை - சமயக் கொள்கை - அரசியற் கொள்கை - படிமலர்ச்சிக் கொள்கை - குடி ஊழிய முறை	
Unit -IV	சமய நம்பிக்கைகளும் வாழ்வியலும்- சமயத்தின் தோற்றம் ஆவியுலகக் கோட்பாடு - உயிரியம் - குலக்குறியியம் - முன்னோர் வழிபாடு-புனிதத் தன்மையை ஏற்படுத்தியுள்ளமை - சடங்கு முறைகள் - மக்கள் வாழ்வில் சமயத்தின் பங்கு	
Unit -V	உணவு ஈட்டுதலும் பரிமாற்ற முன்றகளும் - பொருளியல் முறைகள் - பரிமாற்றமும் பகிர்ந்து கொள்ளுதலும் - பொதுப்படியான பரிமாற்றம் சமச்சீர் பரிமாற்றம் - குலப் பரிமாற்றம் - குடிஊழிய முறை - விருந்துப் பரிமாற்றம் - மெளனப் பரிமாற்றம் அன்பளிப்புப் பரிமாற்றம் மறுபங்கீட்டு முறை.	
Reference Books		
•	பண்பாட்டு மானிடவியல் - பக்தவச்சல பாரதி	
•	சங்க இலக்கியம் (சமூக மானிடவியலின் ஆய்வுக் கட்டுரைகள்). சிலம்பு நா.செல்வராசு, அனிச்சம்.	
•	மானிடவியல் கோட்பாடுகள் பக்தவச்சல பாரதி, வல்லினம் வெளியீடு, முதல் பதிப்பு -2005.	
•	திராவிட மானிடவியல் பக்தவச்சல பாரதி, க.வைஷ்ணவி, காலச்சுவடு பதிப்பகம், 2014, இரண்டாம் பதிப்பு - 2016.	

• பாணர் இன வரைவியல் பக்தவச்சல பாரதி, அடையாளம் வெளியீடு.2015.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CLO1	3	2	1	3	3	2	3	2	1	3	3	2
CLO2	3	3	2		2	3	3	2		2	3	3
CLO3	2	3	2	3	3	3	2	3	2	3	2	3
CLO4	3	2	3	2	3	3	3	2	1	3	3	2
CLO5	3	2	3	3	3	2		2	3	3	3	3

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

<http://www.tamilvu.org/coresite/download/recommendation/E-Learning.pdf>

<http://www.tamilvu.org/library/nationalized/pdf/35-subbureddiyar/488-ariviyalpayitrmmurai.pdf>

<http://www.natkeeran.ca/ta/%E0%AE%95%E0%AE%9F%E0%AF%8D%E0%AE%9F%E0%AF%81%E0%AE%B0%E0%AF%88/%E0%AE%95%E0%AE%B2%E0%AF%8D%E0%AE%B5%E0%AE%BF-20-%E0%AE%95%E0%AE%B1%E0%AF%8D%E0%AE%B1%E0%AE%B2%E0%AF%8D-%E0%AE%95%E0%AE%B1%E0%AF%8D%E0%AE%AA%E0%AE%BF%E0%AE%A4%E0%AF%8D%E0%AE%A4%E0%AE%B2%E0%AE%BF%E0%AE%B2%E0%AF%8D-%E0%AE%87%E0%AE%A3%E0%AF%88%E0%AE%AF-%E0%AE%A8%E0%AF%81%E0%AE%9F%E0%AF%8D%E0%AE%AA%E0%AE%99%E0%AF%8D%E0%AE%95%E0%AE%B3%E0%AF%8D>

Strong -3,Medium-2,Low-1

விருப்பப்பாடம் - இலக்கியத் திறனாய்வும் கொள்கைகளும்

Course Code	Course Name	Category	L	T	P	S	Credits	Ins.Hrs.	Marks		
									CIA	External	Total
	இலக்கிய திறனாய்வும் கொள்கைகளும் Literary Criticism And Theories	Elective	Y	-	-	-	3	3	25	75	100

Pre-requisite	பொருள், யாப்பு, அணி இலக்கணங்களில் அடிப்படை அறிவும் இலக்கியநயம் பாராட்டும் திறனும்.	Syllabus Version	R2022
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Course Objectives: பாட நோக்கங்கள்	
	<ul style="list-style-type: none"> இலக்கியத் திறனாய்வு, இலக்கியக் கொள்கைகள் ஆகியவற்றின் வரையறைகளை அறியச் செய்தல். இலக்கியத் திறனாய்வுக்கும் இலக்கியக் கொள்கைக்குமிடையிலான உறவை உணர்த்தல். சங்க இலக்கியம் முதல் நவீன இலக்கியம் வரையிலான இலக்கிய, இலக்கண வரலாற்றில் இலக்கியக் கொள்கை மாற்றங்கள் பொதிந்திருப்பதையும் உரையாசிரியர்களிடம் காணப்படும் திறனாய்வுக்கூறுகளையும் புலப்படுத்துதல். நவீன இலக்கியக் காலத்தில் திறனாய்வு தனிச் செயல்பாடாக உருவானதன் காரணங்களைப் புலப்படுத்துதல். தமிழ் இலக்கியத் திறனாய்வு வரலாற்றைக் கால அடிப்படையில் போக்குகள், கருத்து வேறுபாடுகள், மாறுபாடுகள் ஆகியவற்றினூடாக அறிமுகப்படுத்தல். வரலாற்றுப் போக்கில் உருவான இலக்கியத் திறனாய்வின் வகைகளை அவற்றின் பின்னணியோடு விளங்கிக்கொள்ளச் செய்தல். இலக்கியத் திறனாய்வு வகைகளை இலக்கியத்தோடு பொருத்தி, மதிப்பிடும் முறைகளைப் பயிற்றுதல்.

Expected Course Outcomes: இப்பாடத்தைக் கற்பதால் விளையும் பயன்கள்	
இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்.	
1.	இலக்கியத் திறனாய்வு என்பது இலக்கியக் கொள்கை சார்ந்தது என்னும் தெளிவு பெறுதல். K1, K3
2.	அந்தத் தெளிவினூடாகத் தமிழ் இலக்கியத் திறனாய்வு வரலாற்று மாற்றங்கள் பற்றிய தேர்ந்த அறிவைப் பெறுதல். K4
3.	தமிழ் இலக்கணங்களில் (பொருள், யாப்பு, அணி) காணப்பெறும் இலக்கியக் கொள்கைகளையும், அவற்றின் வழியாக உரைகளில் அமைந்துள்ள திறனாய்வுக்கூறுகளையும் கொண்டு தமிழ் இலக்கியத் திறனாய்வு மரபை இனங்காணல். K1, K4, K6
4.	டி.கே.சி., க.நா.சு., சி.சு. செல்லப்பா, க. கைலாசபதி, கா. சிவத்தம்பி, ராஜ் கௌதமன், தமிழவன், க. பூரணச்சந்திரன், க. பஞ்சாங்கம் போன்ற திறனாய்வாளர்களின் பங்களிப்புகளை நுட்ப வேறுபாடுகளுடன் பயின்று உள்வாங்குதல். K4
5.	திறனாய்வுப் புலமையைப் பயன்படுத்தி, இலக்கியத்தைத் திறனாய்கின்ற ஆற்றலைப் பெறுதல். K3, K5

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create	
Unit:1	அடிப்படைக் கூறுகள்
இலக்கியம் - செய்யுள் - யாப்பு - பாட்டு - இவற்றிற்கான சொற்பொருள் விளக்கம் - திறனாய்வு - சொற்பொருள் - இலக்கியத் திறனாய்வு - இலக்கியக் கொள்கை - இலக்கிய வரலாறு - இவற்றிற்கிடையேயான உறவு.	
Unit:2	இலக்கியக் கொள்கையும் தமிழும்
இலக்கியக் கொள்கை - வரையறை - சங்க இலக்கியம் - அற இலக்கியம் - பக்தி இலக்கியம் - சிற்றிலக்கியம் - காப்பியம் - முதலியவற்றின் இலக்கியக் கொள்கைகள்.	
Unit:3	புதுத் திறனாய்வு
புதுத்திறனாய்வு - புதுத்திறனாய்வுக் கோட்பாட்டாளர்கள் - ஐ.ஏ. ரிச்சர்ட்சு (I.A. RICHARDS) - கிளியான்த் புரூக்ஸ் (CLEANTH BROOKS), புதுத்திறனாய்வுக் கோட்பாடு - ஆழ்ந்த வாசிப்பு (CLOSE READING) - முரண் (IRONY) - இறுக்கம் (TENSION) - உணர்ச்சி (EMOTIVE) - உருவகம் (METAPHOR), கவிதையின் ஆழ்பொருள் - கவிதையின் முழுமை - இன்ன பிற.	
Unit:4	திறனாய்வு வகைகள்
திறனாய்வு வகைகள் - படைப்பு வழித் திறனாய்வு - மரபுவழித் திறனாய்வு - விதிமுறைத் திறனாய்வு - முருகியல்முறைத் (அழகியல்) திறனாய்வு - விளக்கமுறைத் திறனாய்வு - வரலாற்றுமுறைத் திறனாய்வு - வாழ்க்கை வரலாற்றுவழித் திறனாய்வு - ஒப்பீட்டுமுறைத் திறனாய்வு - முதலியன.	
Unit:5	நவீனத் திறனாய்வின் வகைகள்
நவீனத் திறனாய்வின் வகைகள் - மார்க்சியத் திறனாய்வு - அமைப்பியல் திறனாய்வு - பின் அமைப்பியல் திறனாய்வு - உள்பகுப்பாய்வுத் திறனாய்வு (சிக்கண்ட் ஃப்ராய்ட்) - மூலப்படிவத் திறனாய்வு (கார்ல் யூங்) - பெண்ணியத் திறனாய்வு - தலித்தியத் திறனாய்வு - நவீனத்துவம் - பின் நவீனத்துவம் - திறனாய்வு முறைகளைத் தமிழ்த் திறனாய்வாளர்கள் (டி.கே.சி., க.நா.சு., சி.சு. செல்லப்பா, க. கைலாசபதி, கா. சிவத்தம்பி, கோ. கேசவன் - எம்.ஏ. நுஃமான், கோவை ஞானி - தி.சு. நடராசன் - க. பூரணச்சந்திரன் - ராஜ் கௌதமன் - க. பஞ்சாங்கம் - தமிழவன் - அ. ராமசாமி) பயன்படுத்திய விதங்களை விளக்குதல்.	
Text Book(s)	
1.	தமிழ் இலக்கியத் திறனாய்வு வரலாறு, க. பஞ்சாங்கம், அன்னம் வெளியீடு, சிவகங்கை, 1990.
2.	திறனாய்வுக் கலை - கொள்கைகளும் அணுகுமுறைகளும், தி.சு. நடராசன், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை, திருத்திய பத்தாம் பதிப்பு: 2016.
3.	இருபதாம் நூற்றாண்டின் இலக்கியக் கோட்பாடுகள், அ.அ. மணவாளன், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 1995.
4.	அமைப்பியலும் அதன் பிறகும், தமிழவன், அடையாளம், திருச்சி, மூன்றாம் பதிப்பு: 2019.
5.	தமிழியல் கோட்பாடுகள், துரை. சீனிச்சாமி, அனன்யா பதிப்பகம், தஞ்சாவூர், முதற்பதிப்பு: 2005.
6.	அகத்திணைக் கோட்பாடும் சங்க அகக் கவிதை மரபும், பெ. மாதையன், பாவை பப்ளிகேஷன், சென்னை, முதற்பதிப்பு: 2009.

7.	இருத்தலியமும் மார்க்ஸியமும், எஸ்.வி. ராஜதுரை, விடியல் பதிப்பகம், கோவை, முதற்பதிப்பு: 2011.
8.	இலக்கியமும் மார்க்ஸியமும், சி.இ. மறைமலை, மணிவாசகர் நூலகம், சென்னை, 1992.
9.	மேலை இலக்கியத் திறனாய்வு வரலாறு, வை. சச்சிதானந்தன், மதுரை காமராசர் பல்கலைக்கழகப் பதிப்பு, மதுரை, 1999.
10.	மேலை இலக்கியத் திறனாய்வு அறிமுகம், மீனாட்சி. முருகரத்தினம், என்னெஸ் பப்ளிகேஷன்ஸ், மதுரை, 1987.
11.	An Introduction to Literary Theory, Lalitha Ramamurthi, University of Madras, 2006.
Reference Books	
1.	இலக்கியமும் திறனாய்வுக் கோட்பாடுகளும், க. பஞ்சாங்கம், அன்னம் வெளியீடு, சிவகங்கை, 2016.
2.	திறனாய்வுக் கொள்கைகள், தி.சு. நடராசன், அன்னம் வெளியீடு, சிவகங்கை, முதற்பதிப்பு: 1990.
3.	தமிழில் திறனாய்வுப் பனுவல்கள், தொகுப்பாசிரியர்கள்: தி.சு. நடராசன், க. பஞ்சாங்கம், சாகித்திய அகாதெமி வெளியீடு, சென்னை, முதற்பதிப்பு: 2014.
4.	மார்க்ஸியமும் தமிழ் இலக்கியமும், ஞானி, மெய்யப்பன் பதிப்பகம், சிதம்பரம், முதற்பதிப்பு: 2001.
5.	சிக்மண்ட் ஃப்ராய்ட், உளப்பகுப்பாய்வு அறிவியல், தி.சு. இரவிச்சந்திரன், அலைகள் வெளியீட்டகம், சென்னை, 2015.
6.	தமிழ்க் கவிதையும் மொழிதல் கோட்பாடும், தமிழவன், காவ்யா பதிப்பகம், சென்னை, முதற்பதிப்பு: 1995.
7.	தமிழ் இலக்கியங்கள் கட்டவிழ்ப்பும் கட்டமைப்பும், எல். இராமமூர்த்தி, காவ்யா, சென்னை: 2005.
8.	தமிழ் இலக்கியக் கோட்பாடுகள், முத்துச் சண்முகன், திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூற்பதிப்புக் கழகம் லிமிடெட், சென்னை, 1989.
9.	தொல்காப்பியர் முதல் தெரிதா வரை, பொ.நா. கமலா, காவ்யா, சென்னை, 2007.
10.	தலித்தியம், தொகுப்பாசிரியர்: சு. சண்முகசுந்தரம், காவ்யா, சென்னை, 1996.
11.	திறனாய்வுக்கலை, தி.சு. நடராசன், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை, 2006.

12.	நவீன வாசிப்புகள், மொ. இளம்பரிதி, காவ்யா, சென்னை, 2008.
13.	இலக்கியக் கொள்கைகள், ரெனி வெல்லாக் & ஆஸ்டின் வாரன், (இல. குளோரியா சுந்தரமதி (மொ.ஆ.)), உலகத் தமிழாராய்ச்சி நிலையம், சென்னை, 1985.
14.	இசைங்கள் ஆயிரம், எம்.ஜி. சுரேஷ், மருதா பதிப்பகம், சென்னை, 2005.
15.	மார்க்சியமும் இலக்கியத்தில் நவீனத்துவமும், அ. மார்க்ஸ், பொன்னி புத்தக மையம், சென்னை, 1991.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

- Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>>
- Tamil virtual University Library- [www.tamilvu.org/ library](http://www.tamilvu.org/library) <http://www.virtualvu.org/library>
- Project Madurai - www.projectmadurai.org.
- Chennai Library- www.chennaiibrary.com <<http://www.chennaiibrary.com>>.
- Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
- Tamil E-Books Downloads- [tamilebooksdownloads. blogspot.com](http://tamilebooksdownloads.blogspot.com)
- Tamil Books on line- [books.tamil cube.com](http://books.tamilcube.com)
- Catalogue of the Tamil books in the Library of British Congress archive.org
- Tamil novels on line - books.tamilcube.com

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CLO1	3		3	2	2	2	3	3	3	2	3	2
CLO2	2	2	1	3	2	3	2	2	2	3	2	2
CLO3	2	2	3	3	3	3	2	3	2	3	2	3
CLO4	3	3	2	3	3	2	2	2	3	3	3	2
CLO5	3	2	2	2	3	3	3	2	3	2	2	2

Strong -3,Medium-2,Low-1

விருப்பப்பாடம் - Industry / Entrepreneurship

20% Theory, 80% Practical

Course Code	Course Name	Category	L	T	P	S	Credits	Ins.Hrs.	Marks		
									CIA	External	Total
	Industry / Entrepreneurship	Elective	Y	-	-	-	3	4	25	75	100

முனைவர்ப் பட்டப் பாடத்திட்டம்
(COURSEWORK FOR DOCTORAL DEGREE)

தமிழியல் புலம்
TAMIL STUDIES
2018



மனோன்மணியம் சுந்தரனார் பல்கலைக்கழகம்
திருநெல்வேலி -12

முனைவர் பட்டத்திற்கான பாடத்திட்டச் செயல்நிலை வடிவமைப்பு

(Coursework for Doctoral degree)

தமிழியல் ஆய்வியல் புலம்

மனோன்மணியம் சுந்தரனார் பல்கலைக்கழகம்
திருநெல்வேலி -12

1. இப்பாடத்திட்டம் அடிப்படைத்தாள்கள், சிறப்புத்தாள்கள் ஆகிய இருவகையினம் கொண்டது. ஆய்வாளர்கள் தங்களது படிப்புக்கு முனைவர் பட்ட வழிகாட்டிக்குழு பரிந்துரைக்கும் தாள்களைத் தெரிவு செய்துகொள்ள வேண்டும். ஆய்வியல் நிறைஞர் பட்டம் பெறாதவர்கள் அடிப்படைத்தாள் பட்டியலிருந்து ஒரு தாளைக் கட்டாயம் தெரிவு செய்ய வேண்டும். ஆய்வியல் நிறைஞர் படிப்பு முடித்தவர்களுக்குத் தாள் தெரிவில் வரையறை இல்லை.

2. ஒவ்வொருதாளும் நான்கு மதிப்பலகுகளுடன் 5 கூறுகளைக் கொண்டமையும். மொத்தம் 100 மதிப்பெண்கள் கொண்டது.

3. **வினாத்தாள் அமைப்பு:** மொத்தம் 75 மதிப்பெண் கொண்ட புறமதிப்பீட்டுப் பருவத் தேர்வு. வினாத்தாள் பகுதி அ, பகுதி ஆ என இரண்டு பகுதிகளைக் கொண்டமையும்.

பகுதி அ - ஐந்து மதிப்பெண் கொண்ட 5 வினாக்கள் உள்மாற்று வினா அமைப்புடன் ஒரு பக்கவளவில் விடையளிக்கும் வகையில்.

பகுதி ஆ - 10 மதிப்பெண் கொண்ட 5 வினாக்கள் உள்மாற்று வினா அமைப்புடன் அமையும். எல்லாக் கூறுகளுக்கும் சம வாய்ப்பளிக்க வேண்டும்.

4. **மதிப்பெண்முறை:** அகமதிப்பீடு, புறமதிப்பீடு எனத் தொடர் மதிப்பீட்டு முறை பின்பற்றப்படும். அகமதிப்பீடு 25 மதிப்பெண்கள். 15 மதிப்பெண் கொண்ட ஒரு பருவக் கட்டுரை ஆய்வாளர்கள் அரங்கில் வாசித்தளிக்க வேண்டும். 10 மதிப்பெண்கள் கருத்தரங்குகள், பயிலரங்குகள் பங்கேற்பு ஆகியவற்றிற்கு வழங்க வேண்டும். ஒவ்வொரு தாள்க்கும் தனித்தனிக் கருத்தரங்குகள், பயிலரங்குகள் பங்கேற்பு தேவை. ஒரு நாள் கருத்தரங்கிற்கு/ பயிலரங்கிற்கு 2 மதிப்பெண் என்ற அடிப்படையில் வழங்கலாம். கருத்தரங்கில் கட்டுரை வழங்கினால் ஒரு கட்டுரைக்கு 5 மதிப்பெண் வழங்கலாம். அயல் நாட்டில் நிகழும் கருத்தரங்கில் பங்கேற்றால் 10 மதிப்பெண்கள் வழங்கலாம். பல்கலைக்கழகங்கள் அல்லது பல்கலைக்கழக நிதிநல்கைக் குழுவால் ஒப்புக்கொள்ளப்பட்ட நிறுவனங்களால் நடத்தப்பெறும் ஐந்துநாட்களுக்கு மேற்பட்ட தொடர் பயிலரங்கில் பங்கேற்றால் முன்முனைவர் பட்டத்திற்காகத் தெரிவு செய்யப்பெற்றுள்ள அனைத்துத் தாள்க்கும் 10 மதிப்பெண் வழங்கலாம். கருத்தரங்குகள் / பயிலரங்குகள் பங்கேற்பு ஆய்வுப் பதிவுக்குப் பின்னும் தேர்வு எழுதும் முன்னும் நிகழ்ந்தாகவும் புலத் தொடர்டையதாகவும் இருக்க வேண்டும். அனைத்திற்கும் சான்றிதழ்கள் இணைக்கப்பட வேண்டும்.

புறமதிப்பீட்டுத் தேர்வு 75 மதிப்பெண் கொண்டது. அகமதிப்பீடு மற்றும் புறமதிப்பீடு சேர்த்து மொத்தம் 100 மதிப்பெண்கள் ஒவ்வொருதாள்க்கும் உரியது.

தேர்ச்சிக்கு உள்மதிப்பீடு மற்றும் புறமதிப்பீடு ஆகிய இரண்டும் சேர்த்து மொத்தம் 50 மதிப்பெண்கள் பெற வேண்டும். உள்மதிப்பீடு மற்றும் புறமதிப்பீடுக்குத் தனித்தனியான தேர்ச்சி மதிப்பெண் வரையறை இல்லை.

5. தேர்வுமுறை: அகத்தேர்வுகளை நெறியாளர் நடத்தி மதிப்பெண் வழங்க வேண்டும். புறத்தேர்வைப் பல்கலைக்கழகத் தேர்வாணையம் ஆண்டுக்கு இருமுறை ஆய்வியல் நிறைஞர் பட்டப் படிப்புத் தேர்வின் போது நடத்தும். பல்கலைக்கழகத்தால் ஆய்வாளர்களுக்குப் பரிந்துரைக்கப்பட்டுள்ள முனைவர்ப்பட்ட வழிகாட்டிக்குமுனின் புறநிலைவல்லுநர் (நெறியாளரின் நிறுவனத்தைச் சாராதவர்) புறத்தேர்வின் மதிப்பீட்டாளராகச் செயல்படுவார். புறத்தேர்விற்கான வினாத்தாள் பல்கலைக்கழகத் தேர்வாணையத்தால் பெறப்படும்.

6. பயிற்றுமுறை: ஆய்வாளர்கள் வழிகாட்டிக்குமுனின் பரிந்துரையின் அடிப்படையில் தேர்வு செய்யும் தாள்களை நெறியாளர் பயிற்றுவிக்க வேண்டும். பல்கலைக்கழக விதிகளின்படி பயிற்றுவிக்கும் காலம், வருகைப்பதிவு ஆகியவற்றிற்கு நெறியாளர் பொறுப்பாவார். இவ்வேலைப்பளு காலமுறை வேலைப்பளுவில் கணக்கில் கொள்ளப்படமாட்டாது.

7. திட்ட ஏடு: வழிகாட்டிக்குமுனின் திட்ட ஏடு பரிந்துரைக்கப்படும் ஆய்வாளருக்குத் திட்ட ஏட்டுப்பணி பொருந்தும். இது ஒரு தாள்க்குச் சமமானது. திட்ட ஏட்டைப் பருவத் தேர்வு தொடங்கும் முன் ஆய்வுக் குழுவுக்குச் சமர்ப்பிக்க வேண்டும். நெறியாளரின் நெறிப்படுத்துதலின் கீழ் திட்ட ஏட்டுப்பணியை மேற்கொள்ள வேண்டும். திட்ட ஏடு கணினித் தட்டச்சில் 50 பக்கங்களுக்குக் குறையாமல் அமையவேண்டும். ஆய்வேட்டுடன் இத்திட்ட ஏட்டை ஆராய்ச்சிப் பிரிவில் சமர்ப்பிக்க வேண்டும்.

மதிப்பீட்டுமுறை: திட்ட ஏடு 100 மதிப்பெண்களைக் கொண்டது. அகமதிப்பீடு 50 புறமதிப்பீடு 50 என அமையும். அகமதிப்பீட்டு மதிப்பெண் நெறியாளரால் வழங்கப்படும். புறமதிப்பீடு பல்கலைக்கழகத்தால் ஆய்வாளர்களுக்குப் பரிந்துரைக்கப்பட்டுள்ள முனைவர்ப்பட்ட வழிகாட்டிக் குழுவினின் புறநிலை வல்லுநரால் (நெறியாளரின் நிறுவனத்தைச் சாராதவர்) மதிப்பீடு செய்யப்பட்டு மதிப்பெண்ணை ஆராய்ச்சிப் பிரிவு வழி தேர்வாணையருக்குச் சமர்ப்பிக்க வேண்டும். இப்பணியை முனைவர்ப்பட்டக் கலந்தாய்வுக் கூட்டத்தின் போது செய்யலாம்.

8.படிப்புக்காலம்: முன்முனைவர்ப்பட்டப் படிப்பிற்குரியத் தாள்களை முனைவர்ப்பட்டப் படிப்பிற்குப் பதிவு செய்த இரண்டாண்டுகளுக்குள் நிறைவு செய்ய வேண்டும். ஆய்வாளர்கள் தங்களுக்குப் பரிந்துரைக்கப்படும் தாள்களை ஒரே பருவத்திலும் பயிலலாம். தேர்ச்சித் தவறியவர்கள் மறு பருவத் தேர்வில் தேர்வு எழுதலாம்.

9 முனைவர்ப்பட்டப் பாடத்திட்டக் குழுவால் ஏற்கப் பெற்று கல்விசார் நிலைக் குழுவினின் ஒப்புதல் பெறப்பெற்ற தாள்கள் மட்டுமே முன்முனைவர்ப்பட்டத் தேர்வுக்கு அனுமதிக்கப்படும்.

ஐந்து பிரிவுகளைக் கொண்டதாக அமைகிறது. ஒவ்வொரு பிரிவிலும் நான்கு தாள்கள் உண்டு. மொத்தம் 20 தாள்கள்.

முதல் பிரிவில் ஒரு தாள் கட்டாயமாக எடுக்கப்பட வேண்டும். ஒரு பிரிவிலிருந்து இரண்டு தாள்களுக்கு மேல் எடுக்கக்கூடாது.

ஆய்வாளர் எடுக்கும் தாள்களை அவருக்கான முனைவர்ப்பட்ட வழிகாட்டிக் குழு ஒப்புதல் அளிக்க வேண்டும்.

·பிரிவு:அ. இப்பிரிவில் ஒன்று கட்டாயம்

1. ஆராய்ச்சிநெறிமுறைகள்
2. திறனாய்வு: அடிப்படைகள், முறைகள், அணுகுமுறைகள்
3. இலக்கியக் கொள்கைகளும் கோட்பாடுகளும்
4. தமிழில் இலக்கிய வரலாறுகள்

பிரிவு: ஆ. இலக்கணவியல்தாள்கள்

(இலக்கணவியலில் ஆய்வு செய்பவர்கள் தேர்வு செய்ய வேண்டிய தாள்கள்)

5. தமிழ் இலக்கணவரலாறு
6. எழுத்திலக்கணக் கோட்பாடுகளும் முன்னோடிகளும்
7. சொல்லிலக்கணக் கோட்பாடுகளும் முன்னோடிகளும்
8. செய்யுளியல் கோட்பாடுகளும் முன்னோடிகளும்

பிரிவு:இ.இலக்கியவியல்தாள்கள்

(இலக்கிய ஆய்வுகள் செய்வோர் கற்க வேண்டிய அடிப்படைத் தாள்கள்)

9. தமிழில் கவிதையியல் பார்வைகள்
10. தமிழில் கதையியல் பார்வைகள்
11. தமிழில் அரங்கியல் பார்வைகள்
12. இலக்கிய வடிவங்களும் வகைகளும்

பிரிவு: ஈ.பண்பாட்டியல் தாள்கள்

(இலக்கியத்தையும் பண்பாட்டையும் இணைத்துப் பேசும் ஆய்வுகளையும் நாட்டார் பண்பாட்டாய்வுகளைத் தேர்வு செய்யும் ஆய்வாளர்கள் கற்க வேண்டிய அடிப்படைத் தாள்கள்)

13. இலக்கியமும் பண்பாட்டு மானிடவியலும்
14. தமிழ் வரலாறு: அரசியல், சமயம், தத்துவம், பொருளியல்
15. பண்பாட்டு இயக்கங்களும் தமிழ் இலக்கியங்களும்
16. ஊடகவியலும் பண்பாடும்

பிரிவு: உ. நாட்டார் வழக்காற்றியல் தாள்கள்

17. பனுவலாக்கக் கோட்பாடு
18. நிகழ்த்துதல் மரபுகளும் கோட்பாடும்
19. இனவரைவியல் களஆய்வு
20. திட்ட ஏடு

குறியீட்டு எண்	தாளின் பெயர்	மதிப்பலகு
பிரிவு அ	இப்பிரிவில் ஒன்று கட்டாயம்	
ACWTA01	ஆராய்ச்சி நெறிமுறைகள்	4
ACWTA02	திறனாய்வு: அடிப்படை, முறைகள், அணுகுமுறைகள்	4
ACWTA03	இலக்கியக் கொள்கைகளும் கோட்பாடுகளும்	4
ACWTA04	தமிழில் இலக்கிய வரலாறுகள்	4
பிரிவு ஆ	இலக்கணவியல் தாள்கள் (இலக்கணவியலில் ஆய்வு செய்பவர்கள் தேர்வு செய்ய வேண்டிய தாள்கள்)	
ACWTA05	தமிழ் இலக்கண வரலாறு	4
ACWTA06	எழுத்திலக்கணக் கோட்பாடுகளும் முன்னோடிகளும்	4
ACWTA07	சொல்லிலக்கணக் கோட்பாடுகளும் முன்னோடிகளும்	4
ACWTA08	செய்யுளியல் கோட்பாடுகளும் முன்னோடிகளும்	4
பிரிவு ஆ	இலக்கயவியல் தாள்கள் (இலக்கய ஆய்வுகள் செய்வோர் கற்க வேண்டிய அடிப்படைத் தாள்கள்)	
ACWTA09	தமிழில் கவிதையியல் பார்வைகள்	4
ACWTA10	தமிழில் கதையியல் பார்வைகள்	4
ACWTA11	தமிழில் அரங்கியல் பார்வைகள்	4
ACWTA12	இலக்கிய வடிவங்களும் வகைகளும்	4
பிரிவு ஈ	பண்பாட்டியல் தாள்கள் (இலக்கியம் / பண்பாடு / ஊடகம் ஆகியவற்றை இணைத்துப் பேசும் ஆய்வுகளைத் தேர்வு செய்யும் ஆய்வாளர்கள் கற்க வேண்டிய அடிப்படைத்தாள்கள்	
ACWTA13	இலக்கியமும் பண்பாட்டு மானிடவியலும்	4
ACWTA14	தமிழ் வரலாறு : அரசியல், சமயம், தத்துவம், பொருளியல்	4
ACWTA15	பண்பாட்டு இயக்கங்களும் தமிழ் இலக்கியங்களும்	4
ACWTA16	ஊடகவியலும் பண்பாடும்	4
பிரிவு உ	நாட்டார் வழக்காற்றுக்களைத் தேர்வு செய்யும் ஆய்வாளர்கள் கற்க வேண்டிய அடிப்படைத்தாள்கள்	
ACWTA17	பனுவலாக்கக் கோட்பாடு	4
ACWTA18	நிகழ்த்துதல் மரபுகளும் கோட்பாடும்	4
ACWTA19	இனவரைவியல் களஆய்வு	4
ACWTA P	திட்ட ஏடு	4

1. கார்த்திகேசு சிவத்தம்பி - தமிழில் இலக்கிய வரலாறு, நியூசெஞ்சுரி பக்ஹவுஸ், சென்னை.
2. சிற்பி பாலசுப்பிரமணியன், நீல. பத்மநாபன், தமிழ் இலக்கிய வரலாறு இரண்டு தொகுதிகள் - சாகித்திய அகாடெமி வெளியீடு.
3. பேரா. இரா.மதிவாணன், உ.சேரன், தமிழினி 2000 மாநாட்டுக் கட்டுரைகள், காலச்சுவடு, 2007 அறக்கட்டளை, நாகர்கோவில்
4. கா.சிவத்தம்பி, 2005, உலகத்தமிழிலக்கிய வரலாறு, (கி.பி.1851- 2000) உலகத்தமிழ் ஆராய்ச்சி நிலையம், அடையாறு, சென்னை.
5. ஆ.வேலுப்பிள்ளை, தமிழ் இலக்கியத்தில் காலமும் கருத்தும்,

5. தமிழ் இலக்கண வரலாறு - மதிப்பலகு - 4

நோக்கம்

1. தமிழ் இலக்கண வரலாற்றை அறிந்து கொள்ளுதல்
2. தமிழ் இலக்கண நூல்கள் குறித்த பார்வையை உருவாக்குதல்

அலகு:1. தமிழ் இலக்கண வரலாறு - அறிமுகம் - மறைந்துபோன இலக்கண நூல்கள் - எழுதப்பட்டுள்ள நிலை - சரியான வரலாறு இல்லாத நிலைமை - வெளிவந்துள்ள இலக்கண வரலாறு குறித்த நூல்கள்

அலகு:2 .ஒழுங்குப்படுத்தப்பட்ட முறையான வரலாற்றின் தேவை - தற்கால அறுவகையான இலக்கண வளர்ச்சி - அகராதிகள் - நிகண்டுகள் - உரைகள் போன்றவனவற்றின் வளர்ச்சி. இலக்கணநூல்கள் - தொல்காப்பியம் - வீரசோழியம் - இலக்கணவிளக்கம் - தொன்னூல் விளக்கம் - முத்துவீரியம் - சுவாமிநாதம் - நன்னூல் - அறுவகை இலக்கணம்

அலகு:3. எழுத்து, சொல் இலக்கணம் உணர்த்தும் நூல்கள் - நேமிநாதம் - நன்னூல் - பிரயோக விவேகம் - இலக்கணக் கொத்து - தமிழ்நூல் - தமிழ்க்காப்பு இயம்

அலகு: 4. பொருள் இலக்கண நூல்கள் - இறையனார் களவியல் - பன்னிருபடலம் - புறப்பொருள் வெண்பாமாலை - நம்பியகப்பொருள் - தமிழ் நெறி விளக்கம் - களவியற்காரிகை - மாறணகப்பொருள்- யாப்பு, அணி இலக்கண நூல்கள் - அவிநயம், யாப்பருங்கலம் - யாப்பருங்கலக்காரிகை - யாப்பிலக்கணம் - சிதம்பரச் செய்யுட் கோவை - மாறணப்பாவினம் - விருத்தப்பாவினம் - தண்டியலங்காரம் - மாறணலங்காரம் - அணியிலக்கணம் - பாட்டியல்

அலகு: 5. நுண்வாசிப்புக்குரியன.

1. சோம.இளவரசு: 2003: இலக்கண வரலாறு, மெய்யப்பன் பதிப்பகம், , சிதம்பரம்.
2. ஆ.வேலுப்பிள்ளை: 1979: தமிழ் வரலாற்றிலக்கணம். புாரி புத்தகப் பண்ணை, சென்னை

3. சிவத்தம்பி.கா, 1982: இலக்கணமும் சமூக உறவுகளும், நியூசெஞ்சுரி புக் ஹவுஸ், சென்னை.
4. இரா. இளங்குமரன், 1998: இலக்கணவரலாறு, மணிவாசகர் பதிப்பகம், சென்னை
5. அ.சண்முகதாஸ், 1982: தமிழ் மொழி இலக்கண இயல்புகள், முத்தமிழ் வெளியீட்டுக் கழகம், யாழ்ப்பணம்.
6. செ.வை.சண்முகம், 1994: இலக்கண உருவாக்கம், மணிவாசகர் நூலகம், சிதம்பரம்

6. எழுத்திலக்கணக்கோட்பாடுகளும்முன்னோடிகளும் - மதிப்பலகு - 4

நோக்கம்:

தமிழ் இலக்கணிகளும் மொழியியலாளர்களும் கூறும் எழுத்திலக்கணக் கூறுகளை அறிதலும் மேலாய்வு நோக்கி நகர்தலும்

அலகு: 1. தமிழ் இலக்கணம் - இலக்கண அமைப்பு விளக்கம், எழுத்திலக்கண அமைப்பு தமிழ் எழுத்திலக்கணத்தைப் பற்றிய தெளிவான - செறிவான அமைப்பு விளக்கத்தைத் தருதல். ஒலி - எழுத்து - அசை - மெய்மயக்கம் ஆகியவற்றைத் தொடர்புபடுத்தி, தமிழ் எழுத்தமைப்பினை விளக்குதல். சொல்திரிபு - சொல்லாக்கம் - சொல் தொடர் அமைப்புகளில் இடம்பெறும் புணர்ச்சி மாற்றங்களை உணர்தல்

அலகு: 2. தமிழ் ஒலிகள் - எழுத்துகள்: தொடர்பு, வகைப்பாடு (பிறப்பியல் - எழுத்தியல்: ஒலியியல் - ஒலியனியல்) - ஒலி - எழுத்து - அசை - மெய்மயக்கம்: எழுத்தமைப்பு விளக்கத்தில் இவற்றின் பங்கு (முதன்மை எழுத்து, சார்பெழுத்து, ஒற்றெழுத்து, உயிர்மெய் எழுத்து) மேற்கூற்று ஒலிகள் - வகைகள் - பங்கு.

அலகு 3 சொல் - பதம்: பகுபதம் - பகாப்பதம் சொல் திரிபு சொல்லாக்கத்தில் புணர்ச்சி: தேவையும் வகைப்பாடும் அக, புறப்புணர்ச்சி (உயிர்ஈற்று, மெய்ஈற்று, உருப்புணர்ச்சி, குற்றியலுகரப் புணர்ச்சி

அலகு 4 எழுத்திலக்கணத்தின் பண்பும் பயன்பாடும் - உச்சரிப்பு, வாசிப்பு,

அலகு.5. நுண் வாசிப்புக்குரியன:

1. செ.வை. சண்முகம், 1980 எழுத்திலக்கணக் கோட்பாடு, அனைத்திந்திய தமிழ் மொழியியற் கழகம், அண்ணாமலை நகர்.
- 2.மு.பாலகுமார், மொழியின் பொதுமைக் கூறுகள் கருத்தியல் விளக்கம், 2014: இந்தியத் தேசியத் தேர்வுப் பணி, மைசூர்.
- 3.தொல்காப்பிய மொழியியல் (தொகு), ச.அகத்தியலிங்கம், 1979, அண்ணாமலைப் பல்கலைக்கழகம்: அண்ணாமலைநகர்.
- 4.ஒலியனியல் - மலாயப் பல்கலைக்கழகம், கோலாலம்பூர் (கி.கருணாகரன்ருஇரா. கிருஷ்ணன்)
- 5.கு.பரமசிவம், இக்காலத் தமிழ் மரபு, 2011, அடையாளம்: திருச்சிமாவட்டம்.

7. சொல் இலக்கணக்கோட்பாடுகளும் முன்னோடிகளும் - மதிப்பலகு - 4

நோக்கம்: சொல், சொல்லமைப்பு, சொல்வகைகளைத் தெளிவுபடுத்தி, அவை மொழியமைப்பில் பெற்று விளங்கும் பங்கினை விளக்குதல். தமிழ் இலக்கணிகளும் மொழியியலாளர்களும் கூறும் சொல் இலக்கணக் கூறுகளை அறிதலும் மேலாய்வு நோக்கி நகர்தலும்

அலகு: 1 சொல் - சொல்லும் பொருளும் - சொல்லமைப்பு விளக்கம் - சொல்வகைகள்: பெயர்ச்சொல் - வினைச்சொல் - இடைச்சொல் , உரிச்சொல் (பெயரடை, வினையடை, இடைச்சொற்கள்)

அலகு: 2. பொருண்மை: சொற் பொருண்மை, இலக்கணப் பொருண்மை, சூழற் பொருண்மை (சமுதாயப்பொருண்மை) விளக்கமும் தேவையும் சொற் திரிபு - சொல்லாக்க முறைகள்: விளக்கம் அமைப்பு அடிப்படையில்.

அலகு 3 இலக்கணப் பிரிவுகள் - இலக்கணக் கூறுகள் (பெயரியல், வினையியல்..... வினைமுற்று, வேற்றுமை, பால் - எண்- இடம் பன்மை, எச்சம்.....)

அலகு 4 சொல்லமைப்பு - தொடரமைப்பு விளக்கம், தொடரியல் - தொடர், தொடர் வகைகள், தொடர் இயைபு, வாக்கிய அமைப்பும் வகைகளும் - உரைக்கோவை - செய்யுள் (கவிதைக்) கோவை அமைப்புகள் அமைப்பிணக்கம் - கருத்திணக்கம்: இயைபு தேவை. மாணாக்கருக்குப் பெயர்த் தொகுதிகள், பெயர்ச்சொல் தொகுதி, வினைத்தொகுதி, இடைச்சொல் தொகுதி, உரிச்சொல் தொகுதி போன்றன உருவாக்கும் பயிற்சித் தேர்வு கட்டாயம். களப்பணித் தொகுப்பு அல்லது நூல்வழித் தொகுப்புகள் வழங்கப்பட வேண்டும்.

அலகு 5. நுண் வாசிப்புக்குரியன.

1. செ.வை.சண்முகம், 1984: சொல்லிலக்கணக் கோட்பாடு, அனைத்திந்தியத் தமிழ் மொழியியற் கழகம், அண்ணாமலைநகர்.
2. ஆ.வேலுபிள்ளை, சாசனமும்தமிழும். 2011: குமரன் புத்தக இல்லம், கொழும்பு- சென்னை3.
3. ஆண்டியப்பன்.தே., 1977, “காப்பிய நெறி சொல்லியல்” முத்துப்பதிப்பகம், சென்னை.
4. அகத்தியலிங்கம், ச. (1999) பெயரியல் - வினையியல், மணிவாசகர் பதிப்பகம், சென்னை.
5. நு.:மான், 2007, அடிப்படைத் தமிழ் இலக்கணம், அடையாளம், புத்தாந்தம், திருச்சி.

8. செய்யுளியல் கோட்பாடுகளும்முன்னோடிகளும் - மதிப்பலகு - 4

நோக்கம்: தமிழின் செய்யுள் அமைப்பு உருவான முறைமையை அறிதலும் மேலாய்வு நோக்கி நகர்தலும்

அலகு:1. ஐந்திலக்கணம் அறிமுகம் - யாப்பு சொற் பொருள், விளக்கம்- மரபு இலக்கியமும் யாப்பும் - யாப்பிலக்கண நூல்கள் - தொல்காப்பியச் செய்யுளியல்.

அலகு:2. யாப்பியல் தனியாக வளர்ந்த விதம் - யாப்பருங்கலம், யாப்பருங்கலக்காரிகை - பாக்கள் - ஆசிரியப்பா, வெண்பா, கலிப்பா, வஞ்சிப்பா- பொதுவிலக்கணம் - வகைகள் - சான்றுகள்

அலகு:3.பாவினங்கள் - துறை, தாழிசை, விருத்தம் - குறிப்பாக ஆசிரியவிருத்தம், கலிவிருத்தம், கலித்துறை, கட்டளைக் கலித்துறை - சான்றுகள், அணிகள்: பாட்டியல்களின் வளர்ச்சியில் யாப்பு குறித்த சிந்தனைகள்

அலகு:4. உவமையியலும் அணியிலக்கண வளர்ச்சியும் - நவீனக்கவிதைகளில் யாப்பியல் கூறுகள் - இழந்தன, இருப்பன.

அலகு 5: நுண் வாசிப்புக்குரியன

1. கார்த்திகேசுவதம்பி., 2012, “தொல்காப்பியமும் கவிதையும், நியுசெஞ்சுரி ஹவுஸ், சென்னை.

2. ஜீன்லாரன்ஸ்.செ., பகவதி.கு., 1988, “தொல்காப்பிய இலக்கியக் கோட்பாடுகள்” உலகத்தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை.

3. அகத்தியலிங்கம்.ச., 1999, “தொல்காப்பிய கவிதையியல்”, மணிவாசகர் பதிப்பகம், சென்னை.

4. சோ.ந. கந்தசாமி - தமிழ் யாப்பியலின் தோற்றமும் வளர்ச்சியும், தஞ்சாவூர்: தமிழ்ப் பல்கலைக்கழகம்.

5. ச.வே.சுப்பிரமணியன் - 1972 இலக்கணத்தொகையாப்பு - பாட்டியல்

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI - 12



B.A. ENGLISH SYLLABUS

FROM THE ACADEMIC YEAR 2023-2024

**TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI - 600005**

6. Illustration for B.A. English Curriculum Design

I YEAR

FIRST SEMESTER

Sl. NO.	Course Category	Course	Credit Distribution				Credits	Total Contact Hours/Week	Marks		
			L	T	P	S			CIA	ESE	Total
1	Part-I	LANGUAGE - Tamil	3	3			3	6	25	75	100
2	Part-II	ENGLISH	3	3			3	6	25	75	100
3	Part - III CORE 1	INTRODUCTION TO LITERATURE	3	2			5	5	25	75	100
4	Part – III CORE 2	INDIAN WRITING IN ENGLISH	3	2			5	5	25	75	100
5	Part – III ELECTIVE I	SOCIAL HISTORY OF ENGLAND	2	2			3	4	25	75	100
6	Part-IV	SKILL ENHANCEMENT COURSE I	1	1			2	2	25	75	100
		SKILL ENHANCEMENT COURSE (FOUNDATION COURSE)	1	1			2	2			
TOTAL							23	30			

SECOND SEMESTER

Sl. No	Course Category	Course	Credit Distribution				Credits	Total Contact Hours/Week	Marks		
			L	T	P	S			CIA	ESE	Total
1	PART I	LANGUAGE	3	3			3	6	25	75	100
2	PARTII	ENGLISH	3	3			3	6	25	75	100
3	PART III CORE 3	BRITISH LITERATURE-I	3	2			5	5	25	75	100
4	PART III CORE 4	AMERICAN LITERATURE	3	2			5	5	25	75	100
5	PART III ELECTIVE II	SOCIAL HISTORY OF ENGLAND II	2	2			3	4	25	75	100
6	PART IV	SKILL ENHANCEMENT COURSE-SEC- 2	1	1			2	2	25	75	100
		SKILL ENHANCEMENT COURSE-SEC-3	1	1			2	2	25	75	100
TOTAL							23	30			

FIRST YEAR - SEMESTER I**ME 1– SOCIAL HISTORY OF ENGLAND-I (ELECTIVE)**

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
	Elective	Y	Y	-	-	3	4	25	75	100
Learning Objectives										
LO1	To acquaint the students with background study of social conditions in England									
LO2	To introduce students to some of the major historical development of England									
LO3	To facilitate the students to focus on chronological narrative of events as on major issues trends, events and crisis of the period									
LO4	To make the students aware of the relation between socio political and socio religious events and literary works									
LO5	To expose the students' various trends and movements of England.									
UNIT	Details									
I	Landmarks in Early English History The Norman Conquest – Feudal System – Crusades – Magna Carta – Hundred Years War –1348 – Black Death – 1381- Peasants Revolt – Lollards Movement – Wars of Roses									
II	The Renaissance The Reformation The Dissolution of the Monasteries									
III	Colonial Expansion The Tudor Navy and The Armada The Elizabethan Age & Theatre									
IV	The Origin and Growth of Political Parties in England									
V	Age of Queen Anne Coffee House Life in London.									
Course Outcomes										
COs	On completion of this course, students will;								PO	
CO1	Gain knowledge of various features of social and political history of England								PO1	
CO2	Awareness of the relation between socio- religious events and socio- political works								PO1, PO2	

CO3	Compare history with Literature	PO4, PO6
CO4	Enable to assess the emergence, reasons, development and the impact of social movements	PO4, PO5, PO6
CO5	Assess the overall emergence of English society as a nation.	PO3, PO8
Text Books (Latest Editions)		
1.	Asa Briggs - Social History of England	
2.	Louise Creighton – Social History of England	
3.	G.M. Trevelyan: Social History of England	
References Books (Latest editions, and the style as given below must be strictly adhered to)		
1.	Julia Crick and Elisabeth Van Houts Ed. - Social History of England (900-1200)	
2.	Keith Wrightson - Social History of England (1500-1750)	
3.	Francois Bedarida: A Social History of England 1851-1990, 2 nd ed	
Web Resources		
1.	https://www.literpretation.com/post/social-history-of-enland-6# :	
2.	https://gacbe.ac.insematerial	

Mapping with Programme Outcomes

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	AVERAGE
CO1	3	3	3	2	1	2.4
CO2	3	3	3	1	1	2.2
CO3	3	3	3	1	1	2.2
CO4	3	3	3	1	1	2.2
CO5	3	3	3	3	2	2.8

TOTAL 11.8

MEAN T/5: 2.36

KEY: Strongly correlated – 3; Moderately Correlated – 2; Weakly Correlated – 1

Mapping with Programme Specific Outcomes

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3

CO5	3	3	3	3	3
Weightage	15	15	15	14	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	2.8	3.0

FIRST YEAR - SEMESTER II
ME 2– SOCIAL HISTORY OF ENGLAND-II (ELECTIVE)

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
	Core	Y	Y	-	-	3	4	25	75	100
Learning Objectives										
LO1	Define the social history of England in a political perspective.									
LO2	Interpret literary and cultural texts of historical, geographical, and cultural contexts. Explain socio-political history with literary and cultural texts									
LO3	Identify main trends in the social history of England and their influence on literature									
LO4	Analyze the critical ideas, values and themes that appear in literary and cultural texts of various genres									
LO5	To critically analyze the influence of history and cultural diversity on literature and language.									
UNIT	Details									
I	The union of England and Scotland The Agrarian Revolution The Industrial Revolution									
II	The Methodist movement Other Humanitarian Movements									
III	The American War of Independence England and Ireland French Revolution & Effects of the French Revolution									
IV	The Reform Bills The Victorian Age									
V	Development of Education in the Victorian England Means of transport and Communication World Wars I & II									
Course Outcomes`										
Course Outcomes	On completion of this course, students will;									
CO1	Recognize the milestones of British History from 18 th century till the modern age and can relate how these movements influence the English society and Literatures of that period								PO1	
CO2	Identify the various revolutions and movements of English society leading to form a crucial opinion for the benefit of humanity								PO1,PO2	
CO3	Examine the causes and consequences of the war of Americans and French								PO4,PO6	

CO4	Evaluate the effects of the revolutions and their impacts in literature in a better perspective	PO4,PO5,PO6
CO5	Analyze the reforms and the development of education, transport and communication in the modern era.	PO3,PO8
Text Books (Latest Editions)		
1.	Asa Briggs - Social History of England	
2.	Louise Creighton – Social History of England	
3.	G.M. Trevelyan: Social History of England	
References Books (Latest editions, and the style as given below must be strictly adhered to)		
1.	Julia Crick and Elisabeth Van Houts Ed. - Social History of England (900-1200)	
2.	Keith Wrightson - Social History of England (1500-1750)	
3.	Francois Bedarida: A Social History of England 1851-1990, 2 nd ed	
WebResources		
1.	https://archive.org/stream/draketudornavywi02corbuoft/draketudornavywi02corbuoft_djvu.tt https://archive.org/details/clublifeflondon02timbuoft https://www.britannica.com/biography/Anne-queen-of-Great-Britain-and-Ireland	

Mapping with Programme Outcomes:

Mapping of Course Outcomes to Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	Average
CO1	3	3	2	2	3	2.6
CO2	2	2	3	2	3	2.4
CO3	3	3	3	2	2	2.6
CO4	3	3	3	3	2	2.8
CO5	2	3	2	3	3	2.6
					Total (T)	13/5
					Mean (T/5)	2.6

Key: Strongly Correlated – 3 Moderately Correlated – 2 Weakly Correlated - 1

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3



MANONMANIAM SUNDARANAR UNIVERSITY
ABISHEKAPATTI, TIRUNELVELI - 627 102, TAMIL NADU, INDIA
UG COURSES – AFFILIATED COLLEGES



SYLLABUS FOR B.A. ENGLISH
(CHOICE BASED CREDIT SYSTEM)

(For those who joined the course from the academic year 2021 onwards)

Vision of MS University:

- ❖ To provide quality education to reach the un-reached.

Mission of MS University:

- ❖ To conduct research, teaching and outreach programmes to improve conditions of human living.
- ❖ To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity.
- ❖ To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- ❖ To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development.
- ❖ To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

Vision of the Department:

- ❖ To facilitate the learners to expand their academic search in the field of language and literature,
- ❖ To apply their academic and critical analysis to the prescribed and non-prescribed relevant texts and create their self-style literature and language that would inspire the posterity.

Mission of the Department:

- ❖ To extend an academic assistance to the learners to identify, understand and analyse the various tenets of literature.
- ❖ To make them imbibe social, cultural and moral values that would equip them with both subjective and objective knowledge essential for the understanding of various literatures.

SEMESTER III									
Part I / II/III/IV	Sub. No.	Subject Status	Subject Title	Hours	Credits	Internal	External	Total	Duration in hours
I	1	Language	Tamil / Other Language	6	4	25	75	100	3
II	2	Language	English – III	6	4	25	75	100	3
III	3	Core – 7	British Prose	4	4	25	75	100	3
III	4	Core – 8	Indian English Literature - I	4	4	25	75	100	3
III	5	Core - 9	American Literature – I	5	4	25	75	100	3
III	6	Allied – 3	African Literature	3	3	25	75	100	3
IV	7	Non-Major Elective – 1	English for Competitive Examinations	2	2	25	75	100	3
IV	8	Common	Yoga	2	2	-	-	-	-
Sub. Total				30*	27				
*Excluding Yoga									
SEMESTER IV									
Part I / II/III/IV	Sub. No.	Subject Status	Subject Title	Hours	Credits	Internal	External	Total	Duration in hours
I	1	Language	Tamil / Other Language	6	4	25	75	100	3
II	2	Language	English – IV	6	4	25	75	100	3
III	3	Core – 10	British Fiction	4	4	25	75	100	3
III	4	Core – 11	Indian English Literature - II	4	4	25	75	100	3
III	5	Core - 12	American Literature - II	5	4	25	75	100	3
III	6	Allied – 4	Language and Linguistics	3	3	25	75	100	3
IV	7	Non-Major Elective – 2	Content Writing	2	2	25	75	100	3
IV	8	Common	Computer for Digital Era	2	2	-	-	-	-
V	9	Extension Activity	NCC, NSS, YRC, YWF	-	1	-	-	-	-
Sub. Total				30*	28				
*Computer for Digital Era									

MSU/2021-2022/UG-College/Part-III (B.A. English)/Semester-III/NME I

Non-Major Elective - I

ENGLISH FOR COMPETITIVE EXAMINATIONS

Objectives:

1. To enrich word power for framing flawless sentences.
2. To produce passages without any errors.

Course Outcomes:

CO No.	Upon the completion of this course, students will be able to	PSO Addressed	Cognitive Level
CO - 1	to understand the importance of grammar and its usage in our daily life.	C	K1, K2
CO – 2	learn the basic grammar rules to prepare for Competitive Examinations	E	K3
CO – 3	apply the knowledge of grammar to identify errors and reproduce correct patterns of expressions	F	K3
CO – 4	analyze the varied form of expressions, basics structures, verbal patterns and sentence patterns for the effective use of the English language	A	K4, K5
CO – 5	evaluate the structures and patterns learned and to know their distinctive usages	A	K4, K5
CO – 6	create situation-based and context-based expressions and sentences to clear Competitive Examinations	H	K6

K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze, **K5** – Evaluate, **K6** – Create

Mapping with POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	M	L	S	L	M	M	M	S
CO 2	M	L	S	L	M	M	M	S
CO 3	M	L	S	L	M	M	M	S
CO 4	L	L	L	L	L	L	L	L
CO 5	M	M	M	M	M	M	M	M
CO 6	S	S	S	S	S	S	S	S

S – Strong, **M** – Medium, **L** - Low

Unit I:

Word Substitution (Pg: 151 – 163)

Idioms and Phrases (Pg: 180 – 193)

Unit II:

Synonyms (Pg: 233 - 250)

Antonyms (Pg: 251 – 263)

Unit III:

Proficiency Tests : Synonyms (Pg: 289 - 305)

Proficiency Tests : Antonyms (Pg: 306 – 340)

Unit IV:

Sentence Completion (Pg: 443 – 476)

Common Errors (Pg: 479 – 504)

Unit V:

Comprehension : Prose (Pg: 509 – 514)

Comprehension : Poetry (Pg: 515 – 522)

Prescribed Texts:

A.P. Bhardwaj. *General English for Competitive Examinations* (Banking, Insurance, SSC Examinations, Railway, Defence and MBA Entrance Examinations). Delhi: Pearson, 2013.

Reference Books:

Essential English for Competitive Examinations – 2nd Edition. Disha Publications, 2019.

General English for Competitive Exams – SSC / Banking / Defence / Insurance – 2nd Edition. Disha Publications, 2019.

**M.A.,
ENGLISH**

SYLLABUS

**FROM THE ACADEMIC YEAR
2023 - 2024**

**TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI - 600 005**

Credit Distribution for MA ENGLISH

First Year Semester- I

Part	List of Courses	Credit	No. of Hours
	Core– I Poetry	5	7
	Core – II Drama	5	7
	Core – III Fiction	4	6
	Elective – I Science Fiction, Fantasy and Detective Literature	3	5
	Elective– II Approaches and Methods in English Language Teaching	3	5
		20	30

Semester-II

Part	List of Courses	Credit	No. of Hours
	Core – IV Indian Writing in English	5	6
	Core – V American Literature	5	6
	Core Course – VI Shakespeare Studies	4	6
	Elective Course – III Life Writings	3	4
	Elective Course – IV Literature and Film	3	4
	Skill Enhancement Course [SEC I] – Employability Skill	2	4
		22	30

Second Year Semester-III

Part	List of Courses	Credit	No. of Hours
	Core – VII Post-colonial Literature	5	6
	Core – VIII Contemporary Literary Criticism	5	6
	Core – IX Language and Linguistics	5	6
	Core– X Research Methodology	4	6
	Elective – V Travel Writing (OR) Writing for Media	3	3
	Skill Enhancement Course – II Entrepreneurship Development	2	3
	Internship / Industrial Visit / Field Visit / Research – knowledge Updation Activity	2	-
		26	30

ELECTIVE-I - SCIENCE FICTION, FANTASY AND DETECTIVE LITERATURE

Course Code YEAR/ SEMESTER	Course Name	C a t e g o r y	L	T	P	O	C r e d i t s	I n s t r u c t i o n a l H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
I YEAR/ I SEMESTER	Science Fiction, Fantasy and Detective Literature	Core	Y	Y	-	-	3	5	25	75	100
Learning Objectives											
CO1	To familiarize students with different forms of Science Fiction, Fantasy and Detective Fiction										
CO2	To enable them to identify the basic Structure and themes of Science Fiction										
CO3	To facilitate the learners to appreciate the fundamental features in fantasy fiction										
CO4	To enhance students' knowledge to identify the basic Structure and themes of Science and detective fiction										
CO5	To involve the students to a close reading important representative texts										
Details											
<p>UNIT I BACKGROUND STUDIES Science Fiction and Fantasy, Cyberpunk (From M.H.Abrams) Alien Invasion, Apocalyptic and Post -Apocalyptic Fiction Gothic Science Fiction, Crime Fiction, Mystery Novels, Thriller (From M.H.Abrams)</p> <p>UNIT II DETECTIVE FICTION Arthur Conan Doyle : The Hound of Baskervilles Agatha Christie : Murder on the Orient Express</p> <p>UNIT III SCIENCE FICTION Wilkie Collins : The Woman in White H.G.Wells : The Time Machine</p> <p>UNIT IV FANTASY FICTION Peter Straub : Shadowland Gabriel García Márquez: <i>One Hundred Years of Solitude</i></p>											

UNIT V**SHORT STORIES**

Edgar Alan Poe : The Murders in the Rue Morgues

E.M. Forster : The Machine Stops

Isaac Asimov : The Last Question

Course Outcomes**Course Outcomes**

On completion of this course, students will;

CO1	Identify different forms of Science Fiction, Fantasy and Detective Fiction	PO3
CO2	Fix the representative Detective Fiction in the larger context of Social changes.	PO2, PO6
CO3	Identify the basic Structure and themes of Science Fiction.	PO4. PO5
CO4	Appreciate the fundamental features and explore the major themes in fantasy fiction	PO6
CO5	Gain an understanding of contemporary and future science fiction by studying the history of the genre and many of the works that started important conversations about what it means to be human in a changing world.	PO10

**Text Books
(Latest Editions)**

1. Christie, Agatha. Murder on the Orient Express. 1934. New York: HarperCollins, 2011.
2. Poe, Edgar Allan. The First Detective: The Complete Auguste Dupin Stories. Leonaur, 2009.
3. Wilkie Collins. The Woman in White. New York: Harper and Brothers, 1893.

References Books**(Latest editions, and the style as given below must be strictly adhered to)**

	<ol style="list-style-type: none"> 1. Frank, Lawrence. Victorian Detective Fiction and the Nature of Evidence: The Scientific Investigations of Poe, Dickens, and Doyle. New York: Palgrave Macmillan, 2009. 2. Zembo, James. The Detective Novels of Agatha Christie: A Reader's Guide. Jefferson, NC: McFarland, 2008. 3. James, P. D. Talking About Detective Fiction. London: Faber & Faber, 2010.
	WEB RESOURCES
	https://archive.org/details/EncyclopediaOfScienceFiction https://www.britannica.com/art/science-fiction https://archive.org/details/mammothencyclope0000unse_m8s5 https://www.britannica.com/art/detective-story-narrative-genre https://archive.org/details/shadowland00pete_1 https://archive.org/details/isaac-asimov-the-last-question

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	14	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	2.8	3.0

ELECTIVE – II - APPROACHES AND METHODS IN ENGLISH LANGUAGE TEACHING

Course Code	Course Name	C a t e g o r y	L	T	P	O	C r e d i t s	I n s t r u c t i o n a l H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
	Approaches To English Language Teaching	Core	Y	Y	-	-	3	5	25	75	100
I YEAR/ I SEMESTER											
Learning Objectives											
LO1	To enhance the learning and teaching skills of English										
LO2	To familiarize students about the basic concepts and theories related to English language teaching										
LO3	To focus on the problems in language teaching										
LO4	Explore different ways of testing										
LO5	Practice writing lesson plans and teaching										
Details											
UNIT I											
The Grammar – Translation method											
The Direct method											
The Audio-Lingual method.											
Oral situational Approach											
UNIT II											
The Communicative Approach											
Task based Language Teaching: L S R W Skills, Grammar and Vocabulary											
UNIT III											
Content and Language Integrated Learning											
UNIT IV											
Testing and Evaluation											
Norm vs Criterion-Referenced Testing											
UNIT V											
Lesson Planning											
Teaching Practice: Lesson Plans											

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Identify teaching methods/approaches	PO3
CO2	Learn to teach skills - L S R W and literature	PO1, PO2
CO3	Identify the objectives, active role of learners, teachers and materials	PO4, PO5
CO4	Testing and Evaluating learners using norm and criterion-referenced methods of assessment	PO3, PO7
CO5	Learn to prepare lesson plans to teach English	PO8, PO9
Text Books (Latest Editions)		
1.	Richards, Jack C., and Theodore S. Rodgers. Approaches and Methods in Language Teaching. Cambridge University Press, 2015.	
2.	Saraswathi. V, English Language Teaching: Principles and Practice	
3.	Penny Ur. A Course in Language Teaching Practice and theory	
References Books (Latest editions, and the style as given below must be strictly adhered to)		
1.	Dr. Shaikh Mowla Methods of Teaching English.	
2.	Dr. Gurav H.K Teaching Aspects of English Language.	
Web Resources		
1	http://www.ehow.com/way-5557572_effective-teaching-strategies- prose.htm/	
2.	https://www.englishclub.com/efl/tefl-articles/tips/history-of-english-language-teaching/	
3.	https://tesoladvantage.com/methods-and-approaches-of-english-language-teaching/	
4.	https://www.cambridge.org/core/books/abs/approaches-and-methods-in-language-teaching/current-communicative-approaches/1A7EEF3288E7A5688C36E1504138AF17	
5.	https://www.teachingenglish.org.uk/sites/teacheng/files/F044%20ELT-48%20The%20Use%20of%20the%20Media%20in%20English%20Language%20Teaching_v3.pdf	

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	M
CO2	M	S	S	M	M	S	M	M	M	S
CO3	S	S	M	M	S	M	S	M	S	M
CO4	S	S	S	S	M	S	S	M	S	M
CO5	S	M	S	S	S	S	M	M	M	S

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	14	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	2.8	3.0

ELECTIVE III – LIFE WRITINGS

Course Code YEAR/ SEMESTER	Course Name	C a t e g o r y	L	T	P	O	C r e d i t s	I n s t · H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
I YEAR/ II SEMESTER	Life Writings	Core	Y	Y	-	-	3	4	25	75	100
Learning Objectives											
LO1	To introduce life writing as an important genre in literary studies.										
LO2	To make students realize the literary significance of life writings.										
LO3	To make students understand various functions of life writing.										
LO4	To familiarize students with life writings of success stories to conflict zone testimonies and literary works										
LO5	To facilitate students to explore the history of selfhood itself, particularly as it has tracked the rise of individualism and individuality										
Details											
Unit I:											
Defining Kinds of Life Writing (1-4 from Sidonie Smith)											
Autoethnography, Bildungsroman, Confession, Diary, Memoir, Slave Narrative, Travel Narrative											
<p style="margin-left: 40px;">1. Carole Angier : Biography (Essay) (pp. 47-63) <i>The Arvon Book of Life Writing: Writing biography, autobiography and memoir</i> Sally Cline, Carole Angier</p> <p style="margin-left: 40px;">2. Sally Cline : Autobiography (Essay) (pp. 64-81) <i>The Arvon Book of Life Writing: Writing biography, autobiography and memoir</i> Sally Cline and Carole Angier</p> <p style="margin-left: 40px;">3. Sidonie Smith : Fifty-two Genres of Life Narrative (pp. 183-208) Appendix A, <i>Reading Autobiography: A Guide for Interpreting Life Narratives</i></p>											

Sidonie Smith and Julia Watson

Unit II: Autobiography (BTCL- K2, K4)

1. Malini Chib : One Little Finger (Autobiography)
2. Manobi Bandopadhyay: A Gift of Goddess Lakshmi

Unit III: Memoirs and Testimonials (BTCL- K2, K4)

1. Viktor Frankl : Man's Search for Meaning (Memoir)
2. Mourid Barghouti : I Saw Ramallah (Memoir)
3. Urvashi Butalia : The Other Side of Silence: Voices from the Partition (Memoir / Testimonials)

Unit IV: Literary Works (Drama) (BTCL- K2, K4)

1. Eugene O'Neil : Long Day's Journey into Night

Unit V: Autofiction and Short Life Narratives (BTCL- K2, K4)

1. Christopher Isherwood : Goodbye To Berlin (Autofiction)
2. Nandini Oza : Homeless: Revli's Story
Whither Justice: Stories of Women in Prison

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Become familiar with various subgenres of life writing.	PO2
CO2	Sensitize themselves to the predicament of various marginalized sections.	PO3, PO6
CO3	Comprehend the significance of life writing as a literary genre.	PO1,PO2, PO5
CO4	Get acquainted with the role of personal narrative in writing history.	PO6
CO5	Comprehend the different socio, cultural and political dimensions	PO8, PO9

**Text Books
(Latest Editions)**

1. Sally Cline and Carole Angier, *The Arvon Book of Life Writing: Writing biography, autobiography and memoir.*
2. Sidonie Smith and Julia Watson, *Reading Autobiography: A Guide for Interpreting Life Narratives.*

References Books

1.	Laura Marcus – Auto / Biographical discourses: Theory, Criticism and Practice
Web sources	
1	https://www.123helpme.com/essay/The-Ending-to-Eugene-ONeils-Long-Days-132053
2.	https://rupkatha.com/V13/n1/v13n120.pdf

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

ELECTIVE IV - LITERATURE AND FILM

Course Code YEAR/ SEMESTER	Course Name	C a t e g o r y	L	T	P	O	C r e d i t s	I n s t r u c t i o n a l H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
I YEAR/ II SEMESTER	LITERATURE AND FILM	Core	Y	Y	-	-	3	4	25	75	100
Learning Objectives											
LO1	Finding the popular interest in films with technical and socio-cultural dimensions of film appreciation.										
LO2	Understanding the bond between the films and literature.										
LO3	Analyzing the literary texts in comparison with the films.										
LO4	Critical appreciation of films in the background of literary theories.										
LO5	Tracing the differentiation in films from different parts of the world.										
Details											
UNIT I											
Shakespeare - Othello (Text And Film) Direction - Oliver Paker											
UNIT II											
Mary Shelly – Frankenstein (Text And Film) Direction – James Whale											
UNIT III											
Charles Dickens - A tale of two cities (Text And Film) Direction – Jack Conway											
UNIT IV											
G.B.Shaw Pygmalion (My fair Lady) Text And Film) Direction – George Cukor											
UNIT V											
J.K. Rowling - Harry Potter and the Chamber of Secrets (Text and Film) Direction – Chirs Columbus											

Movies for Appreciation

1. A Few Good Men - Legal Drama by Aaron Sorkin's 1989

2. Confessions of a Shopaholic - Sophie Kinsella

3. Elippathayam - Adoor Gopalakrishnan

Bridge on River Kwai - Novel to Film

	Total	90
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Film Review and appreciation becomes handy for the Students	PO1,PO2
CO2	Connecting film and literature nuances effectively	PO3, PO4
CO3	Exposure to film techniques and genres	PO7

CO4	Critical appreciation of films	PO6,PO8
CO5	Analysing film forms effectively	PO10
Text Books (Latest Editions)		
1.	Louis Giannetti, 1972, Understanding Movies, Prentice Hall, New Jersey.	
2.	Ed. S. Vasudevan, 2000, Making Meaning in Indian Cinema, OUP, New Delhi.	
References Books (Latest editions, and the style as given below must be strictly adhered to)		
1.	Ed. Bill Nichols, 1993, Movies and Methods Vol.I, Edition Seagull Books, Calcutta.	
2.	Ed. Bill Nichols, 1993, Movies and Methods Vol. II, Edition Seagull Books, Calcutta.	
3	Susan Hayward, 2004, Key Concepts in Cinema Studies, Routledge, London.	
Web Resources		
1	www.academicinfo.net/film.html .	
2.	https://www.norton.com/books/9780393420531	
3.	https://journalism.uoregon.edu/directory/faculty-and-staff/all/jwasko	
4.	https://m.economictimes.com/opinion/interviews/there-is-a-lot-of-power-in-tamil-cinema-because-of-its-closeness-to-everyday-life-anand-pandian-author-reel-world/amp_articleshow/51169927.cms	
5.	https://guides.library.yale.edu/c.php?g=295800&p=1975065	

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Semester III

Paper	Subject Code	Subject	Core/ Elective	Credit	Hours Per Week	Internal Marks	External Marks	Total Marks	Exam Duration in Hours
XIII		British Fiction	Core	4	5	25	75	100	3
XIV		Australian Literature	Core	4	5	25	75	100	3
XV		Research Methodology	Core	4	5	25	75	100	3
XVI		Aspects of English Language – I	Core	4	5	25	75	100	3
XVII		Literary Theory – II	Core	4	5	25	75	100	3
XVIII		Green Literature (or)	Elective	3	5	25	75	100	3
		National Literature in Translation	Elective						

Semester IV

Paper	Subject Code	Subject	Core/ Elective	Credit	Hours Per Week	Internal Marks	External Marks	Total Marks	Exam Duration in Hours
XIX		Gender Studies	Core	4	5	25	75	100	3
XX		Asia Pacific Literature	Core	4	5	25	75	100	3
XXI		Aspects of English Language – II	Core	4	5	25	75	100	3
XXII		Content Writing (or)	Elective	3	5	25	75	100	3
		Translation Studies: Theory and Practice	Elective						
XXIII		Project	Core	5	10	25	75	100	--

Papers – 23

Credits – 90

Core – 19 --Elective –3 (To be chosen from 6 papers) – Project – 1

L	T	P	C
5	0	0	3

SEMESTER-III			
Elective		GREEN LITERATURE	
Code:	Hrs / Week: 5	Hrs / Semester: 75	Credits: 3

Scope: To create an awareness among the students about Ecocriticism and the role of literature in addressing contemporary issues of environmental concerns.

Objectives:

- To introduce the students to specific literary texts based on the ecological concerns and focus on the need to address the rising global threats.
- To express care and concern for the environment and advocate a more thoughtful and ecologically sensitive relationship between man and nature.

Course Outcomes:

C.O. No.	Upon the completion of this course, students will be able to	PSOs Addressed	Cognitive Level
CO 1	tabulate the indomitable part of nature in life.	A, D	K1
CO 2	exemplify the most relevant critical theories through literary texts.	B, C, F	K2, K3
CO 3	elucidate the role of literature in addressing contemporary issues such as environmental concerns.	E, F	K3, K4
CO 4	examine the social issues from the eco-critical perspective.	D, E, F	K4, K5
CO 5	prioritise ethical, cross-cultural and historical context of the environmental issues.	C, D, E	K5
CO 6	study literature and environment from an interdisciplinary point of view to analyse and brainstorm possible solutions for promoting or hampering sustainable practices crucial for environmental conservation	F, G	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 - Create

Mapping with POs

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	S	S	M	L	M	S	S
CO 2	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S
CO 5	S	S	S	M	S	S	S	S
CO 6	S	S	S	L	M	S	S	S

S – Strong – 87.5%, M – Medium – 8.33%, L – Low – 4.16%

UNIT I -INTRODUCTION TO ECOCRITICISM- DEFINITION, SCOPE AND IMPORTANCE OF ECOCRITICISM

John Ruskin	:	Landscape, Mimesis, Morality
Todd Andrew Borlik	:	Introduction: An Extract from <i>EcoCriticism: An Early Modern English Literature</i>
Cheryll Glotfelty & Harold Fromm	:	"Literary Studies in an age of Environmental Crisis". An Extract from <i>The Ecocriticism Reader: Landmarks in Literary Ecology</i> .

Suggested Readings:

Timothy Clark, *The Cambridge Introduction to Literature and the Environment*. C.U.P. Illustrated Edition.
Laurence Coupe, *The Green Studies Reader: From Romanticism to EcoCriticism*, Routledge.
Linda Hutcheon, *The Eruption of Postmodernity: The Post-Colonial and the Ecological*

UNIT II –POETRY

William Cullen Bryant	:	The Gladness of Nature
Mamang Dai	:	The Voice of the Mountain
Dan Beachy Quick	:	Endangered Species
Gieve Patel	:	On Killing a Tree

Suggested Reading:

Louise Hutchings Westling. Ed. Cambridge Companion to Literature and Environment. C.U.P. 2013.

UNIT III- SHORT STORY

Mahasweta Devi	:	Pterodactyl
Liam O'Flaherty	:	The Waves
Ruskin Bond	:	The Tree Lover

Suggested Reading:

Pramod K. Nayar. *Ecoprecarity: Vulnerable Lives in Literature and Culture*, Routledge, 2019.

UNIT IV– FICTION

Indra Sinha	:	Animal's People
Margaret Atwood	:	Oryx and Crake

Suggested Reading:

Garrard Greg. Ed *The Oxford Handbook of Ecocriticism*, O.U.P., 2014

UNIT V – DRAMA

Henrik Ibsen : An enemy of the people
John Heywood : The Play of the Weather

Suggested Reading:

Scott Slovic, & et.al. Global Perspectives on Eco-Aesthetics and Eco-Ethics A Green Critique, Lexington Books, 2019.

References:

Todd A. Borlik, *Ecocriticism and Early Modern English Literature: Green Pastures: 16 (Routledge Studies in Renaissance Literature and Culture)*, Routledge, 2010.
Cheryll Glotfelty (Ed), Harold Fromm (Ed), *The Ecocriticism Reader: Landmarks in Literary Ecology*, University of Georgia Press, 1996.

Mamang Dai, "The Voice of the Mountain",

https://www.asu.edu/piperarcwcenter/how2journal/archive/online_archive/v2_4_2006/current/indian/dai.html

William Cullen Bryant, The Gladness of Nature, <https://poets.org/poem/gladness-nature>

Dan Beachy Quick, Endangered Species, <https://poets.org/poem/endangered-species#:~:text=About%20This%20Poem,species%2C%20most%20notably%20the%20monarch.>

Gieve Patel, On Killing a Tree, <https://www.poemhunter.com/poem/on-killing-a-tree/>
Mahasweta Devi (Au), Gayatri Chakravorty Spivak (Tr), *Imaginary Maps*, Thema, 2001.

Henrik Ibsen, *An Enemy of the People*, Sovereign, 2018.

Liam O'Flaherty, Angeline A. Kelly (Ed), *The Wave*, Prentice Hall Press, 1980.

Ruskin Bond, *The Tree Lover*, Penguin Random House India, 2017.

Indra Sinha, *AnimalsPeople*, Simon & Schuster, 2008.

John Heywood, *The Play of the Weather*, Andesite Press, 2017.

Margaret Atwood, *Oryx and Crake*, Virago, 2013.

L	T	P	C
5	0	0	3

SEMESTER-III			
Elective	NATIONAL LITERATURE IN TRANSLATION		
Code:	Hrs / Week: 5	Hrs / Semester: 75	Credits: 3

Scope: To enable the students to learn and appreciate the literatures written in different native languages and varied cultures.

Objectives:

- To help the students learn the texts written in different languages in India and understand their distinct socio-history and cultural identities.
- To familiarise the students with the different regional literary movements of India.

Course Outcomes:

C.O. No.	Upon the completion of this course, students will be able to	PSOs Addressed	Cognitive Level
CO 1	relate the thematic concerns in the regional literatures of India.	A, B, C	K1, K2
CO 2	illustrate regional consciousness in their reading of literary texts.	B, C	K2
CO 3	distinguish the socio-cultural movements that formulated the regional literature.	B, C, D	K3, K4
CO 4	categorise the regional literatures translated in English.	E, F, H	K3, K4
CO5	validate the historical, the social, and the cultural crises specific to the region.	B, C, D	K5
CO 6	Perform comparative study of the original and the translated texts to see the process of negotiation that constructs, and is constructed in, the English language translation	F, G, H	K6

Mapping with POs

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S
CO 6	S	S	S	S	S	S	S	S

S – Strong – 100%, M – Medium – 0%, L – Low – 0%

UNIT – I - POETRY

Subramania Bharati	:	The Victory Drum.
Sundara Ramaswamy	:	The Artist at Sea.
O. N. V. Kurup	:	A Requiem to Mother Earth
Kedarnath Singh	:	Where Would I Go?
Nilmani Phookan	:	Three Poems

Suggested reading:

K Satchidanandan, *One Hundred Indian Poets*, National Book Trust, India, 2000.

UNIT - II – PROSE

Muthu Mohan	:	"Foreword" from Ponneelan's New Dharshans
K. Srilata & Swarnalatha Rangarajan:	:	Interview with 1) Bama, 2) Sivakami
Bal Gangadhar Tilak	:	Freedom is my Birthright.

Suggested reading:

V. V. B. Rama Rao, *Regional Language Fiction: Transformative Essays on Literary Translation*, Authorspress, New Delhi.

Nissim Ezekiel, Meenakshi Mukherjee (ed), *Another India, New Delhi*, Penguin, 1990

UNIT – III - SHORT STORIES

Jayakanthan	:	The Heroine
U. R. Anantha Murthy	:	Ghatastraddha
Gopinath Mohanty	:	Tadpa

Suggested reading:

Bhabani Bhattacharya, *Contemporary Indian Short stories Vol.2 &3*, Delhi, Sahitya akademi, 1959&1964

UNIT – IV - DRAMA

Badal Sircar	:	Bhoma
Vijay Tendulkar	:	The Vultures

Suggested reading:

V K.Gokak (ed), *Literature in Modern Indian Languages*, The Publication Division, Delhi, 1957

UNIT – V - FICTION

Imayam	:	Arumugam
M. T. Vasudevan Nair	:	The House around the Courtyard

Suggested reading:

Adil Jussawalla (ed), *New Writing in India*, Harmondsworth, Penguin, 1974.

References:

- Sundara Ramaswamy, *The Ways of Dogs*, Kalachuvadu Trust, Nagercoil.
- Velcheru Narayana Rao, *Twentieth Century Telugu Poetry -An Anthology*, Oxford India Paperbacks.
- O. N. V. Kurup, 'A Requiem to Mother Earth', *In the Shade of the Sahyadri*, Oxford University Press.
- <https://www.worldliteraturetoday.org/blog/poetry/three-poems-india-kedarnath-singh>
- https://www.parabaas.com/translation/database/translations/poems/sankhaghosh_just.html
- <https://www.youthaffairz.in/historyjuly2012.html>
- K. Srilata&Swarnalatha Rangarajan, *Lifescapes*, Women Unlimited Publication, New Delhi.
- D. Jayakanthan (Author), Deepalakshmi J. (Translator), *The Heroine and Other Stories*, Niyogi Books, 2017.
- U. R. Anantha Murthy, *Ghatasraddha*, Indian Horizon, Vol No: 46 Published by Indian Council for Cultural Relations, New Delhi.
- Gopinath Mohanty, *Tadpa*, Indian Horizon, Vol No: 46 Published by Indian Council for Cultural Relations, New Delhi.
- Badal Sircar, *Three Plays: Procession*, Bhoma, Stale News, Seagull Books, Kolkata, 2009.
- Vijay Tendulkar, *The Vultures*, Prakash Book Depot, Chennai.
- Imayam, *Arumugam*, Katha Publications, Mumbai.
- M. T. Vasudevan Nair, *Naalukettu: The House with a Courtyard and Four Pillars*, Oxford University Press, 2010.

L	T	P	C
5	0	0	3

SEMESTER-IV			
Elective		CONTENT WRITING	
Code: CENE4A	Hrs / Week: 5	Hrs / Semester: 75	Credits: 3

Scope: To have a proficient and practical knowledge about content writing.

Objectives:

- To inculcate the knowledge of documenting sources.
- To develop internet skills for writing in the social media.

Course Outcomes:

C.O. No.	Upon the completion of this course, students will be able to	PSOs Addressed	Cognitive Level
CO 1	record the knowledge of digital skills essential for the media.	E, G, H	K1
CO 2	outline an idea on content marketing.	G, H	K2
CO 2	compute practical skills on earning through content writing.	E, G, H	K2, K6
CO 4	analyse and present a topic of study in a field-specific language.	F, G, H	K4, K5
CO 5	standardise teamwork skills.	G, H	K3
CO 6	demonstrate knowledge of editing and revision techniques, the world of publishing, and other career-related aspects of writing.	F, H	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 - Create

Mapping with POs

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	M	M	L	L	L	M	M	L
CO 2	L	L	L	L	L	S	M	S
CO 3	L	L	L	L	L	S	S	S
CO 4	M	S	L	M	L	S	S	M
CO 5	L	L	L	L	L	S	S	S
CO 6	L	L	S	M	L	S	S	S

S – Strong – 31.25%, M – Medium – 18.75%, L – Low – 50%

UNIT – I - LANGUAGE SKILLS

Introduction - Writing Rules - Writing GPS - Cross Out the Wrong Words - Keep It Simple – Readability - Grammar Rules - Confusing Words.

Suggested Reading:

S. C. Sood, *Developing Language Skills*, Manohar Publishers.

UNIT – II - PUBLISHING

Publishing Rules - Brand Journalism - Interview Tips – Copyright - Blog Posts, Podcast, Facebook Posts, Tweets, and Other Marketing Content - Writing for Twitter - Hashtags - LinkedIn Profile.

Suggested Reading:

Arielle Eckstut, David Henry Sterry, *The Essential Guide To Getting Your Book Published: How To Write It, Sell It, And Market It - Successfully*, Workman Publishing.

UNIT – III - CONTENT TYPES

Business Writing Skills - Technical Writing - Academic Writing - Email Writing - News Letter - Brochure Writing - Research Paper - Academic Book Writing - Rubrics - Fiction Writing - SEO Writing - Medical Writing - Statement of Purpose - Writing a Critique.

Suggested Reading:

C. C. Chapman & Ann Handley, *Content Rules*, Wiley Publishers.

UNIT – IV - CONTENT STRATEGY

Strategic Vs Non- Strategic Content - Creating Effective Content - Overcoming Challenges - Idea Generation Tools - Creating Strategic Content to promote Brands - Market Segmentation - Creating Target Persona - Ninja Writing.

Suggested Reading:

Robert Ashton & Jessica Juby, *Writing for the Web*, Teach Yourself Publications.

UNIT – V - EARN ONLINE

Websites for Content Writing Projects - Tips to Earn as a Content Writer - Successful Content Writing Career - How to Become a Published Author - Guest Posting - Collecting Payments.

Suggested Reading:

Lirish Chinnappa, *Content Writing as a Career Option*, Amazon Digital Service.

References:

(Unit I & II) - Ann Handley, *Everybody Writes*, Wiley Publishers.

(Unit III, IV & V) - Kounal Gupta, *The Only Content Writing Handbook*, Henry Harvin, India.

L	T	P	C
5	0	0	3

SEMESTER-IV			
Elective	TRANSLATION: THEORY AND PRACTICE		
Code:	Hrs / Week: 5	Hrs / Semester: 75	Credits: 3

Scope: To introduce the students to the theories and theorists of translation through the different ages, of traditions, and of emerging fields in translation.

Objectives:

- To encourage the students to recognise various problems and challenges faced by the translators concerning literary texts.
- To equip the students with various procedures and techniques of translation.

Course Outcomes:

C.O. No.	Upon the completion of this course, students will be able to	PSOs Addressed	Cognitive Level
CO 1	recall the various theories of translation and their importance in the contemporary world.	F, H	K1
CO 2	extend the skill to translate and engage in advanced study in the field of translation.	B, H	K2, K3
CO 3	apply various methods of interpretation related to Translation Studies.	C, F, H	K3
CO 4	assess the multi-cultural approaches and navigate the linguistic problems in translation.	C, D, F, H	K4, K5
CO 5	perceive the difficulties in translation at a practical level and evaluate alternative strategies for dealing with them.	F, G, H	K4, K5
CO 6	choose between different models of translation on the basis of their relative merits and demerits.	F, H	K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 - Create

Mapping with POs

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	S	S	S	S	S	M	S
CO 2	M	S	S	S	M	S	S	S
CO 3	S	S	S	S	S	S	M	S
CO 4	S	S	S	S	S	S	M	S
CO 5	L	S	M	M	L	S	S	S
CO 6	S	S	S	S	S	S	S	S

S – Strong – 81.25%, M – Medium – 14.58%, L – Low – 4.16%

UNIT - I – TRANSLATION AND ITS PERSPECTIVES

Language as a Medium - Referential Meaning - Connotative Meaning - Definitions of Translation - Linguistic and Cultural Distances between the Source and Target

Languages - Lexical Untranslatability

Suggested Reading:

Susan Bassnett-McGuire, Andre Lefevere, Susan Bassnett, *Translation, History and Culture*, Continuum International Publishing Group Ltd, 1998.

UNIT - II – TRANSLATION THEORIES AND THEORISTS

Major Theories

Philological Theory - Linguistic Theory - Sociolinguistic Theory - Integrated Theory

Major Theorists

J.C. Catford, Eugene A. Nida , Peter Newmark, Sujit Mukherjee, Juliane House

Suggested Reading:

Theo Hermans, *The Manipulation of Literature (Routledge Revivals): Studies in Literary Translation*, Routledge, 2015.

UNIT - III – LEXICAL PROBLEMS AND COMPENSATORY MECHANISMS

Borrowing – Transliteration - Literal Translation – Definition – Addition – Omission - Lexical Creation – Transcreation – Substitution - Generic and Specific Names - By Using Multi-Lexical Units - Hybrid Formation or Loan Blending

Suggested Reading:

Piotr Kuhiwczak Karin Littau, *A Companion to Translation Studies*, Orient BlackSwan, 2011.

UNIT - IV – SYNTACTIC AND STYLISTIC PROBLEMS AND PROCEDURES

Double Words - Repetitive Words – Ideophones - Pleonasm and Reduplications - Active and Passive Constructions - Gender and Number.

Imagery – Idioms – Proverbs - Non-verbal Communication - Honorific Affixes - Proper Name – Vocatives - Play on Words - Transformation of Sentences

Suggested Reading:

Peter Newmark, *About Translation*, Multilingual Matters, 1991.

UNIT - V – TRANSLATION PRACTICE

Perumal Murugan : Poonachi: Or the Story of a Black Goat

(OR)

Vaikom Muhammad Basheer : Pattumma's Goat.

Discussions and Questions from the translated texts, based on the concepts discussed in Unit 2,3 and 4.

Suggested Reading:

Clifford.E.Landers, *Literary Translation: A Practical Guide*, Multilingual Matters, 2001.

References:

Nair, Shreedevi K. *Aspects of Translation*. New Delhi: Creative Books, 1996.

Nida, Eugene A. *Towards a Science of Translating*. London: Brill, 1964.

Nihamathullah A. *Procedures of Translation*. Tirunelveli: Shameem Publication, 2009. Unit I - Pages 1 to 15 & Unit II Pages 16 to 36.

Hema K. *Theory and Practice of Translation*. Madurai: Shanlax Publications, 2019

Susan Bassnett, *Translation Studies III Edition*. Routledge, London & New York, 2002. - Pages 47 to 80.

Peter Newmark, *A Textbook of Translation*. Prentice Hall, 1987.

Perumal Murugan (Au), N Kalyan Raman (Tr), *Poonachi: Or the Story of a Black Goat*, Context, 2018.

Perumal Murugan, *Poonachi Allathu Oru Vellatin Kathai*, Kalachuvadu Publications, 2016.

Vaikom Muhammad Basheer, *Pattumma's Goat*, Mathrubhumi Books, 2018.

Vaikom Muhammad Basheer, *Pathummayude Aadu*, DC Books, 2019.

4.PROGRAMME STRUCTURE

MANONMANIAMSUNDARANARUNIVERSITY, TIRUNELVELI-627012.

UGCOURSES- AFFILIATEDCOLLEGES

B.Sc. Mathematics

(ChoiceBased Credit System)

(Witheffectfromtheacademicyear2021- 2022 onwards)

	Part	Sub. No.	Subject Status	Subject Title	Hrs/ Week	Credits	Marks				
							Maximum			Passing Minimum	
							Int.	Ext	Tot.	Ext.	Tot.
I	I	1	Language	Tamil/OtherLanguages	6	4	25	75	100	30	40
	II	2	Language	CommunicativeEnglish-I	6	4	25	75	100	30	40
	III	3	Core-IPaper-I	Calculus and ClassicalAlgebra	6	4	25	75	100	30	40
		4	Addonmajor(Mandatory) Paper-II	ProfessionalEnglishforP hysicalSciences-I	4	4	25	75	100	30	40
		5	Allied-I(ForMaths students)	Statistics-I OR Physicswith Practical /Chemistry withPractical/ ComputerScience**	6	3	25	75	100	30	40
				Allied-I (ForScience students)	AlgebraandDifferentialE quations	6	4	25	75	100	30
	IV	6	Common	EnvironmentalStudies	2	2	25	75	100	30	40
Total					30	21/23					
II	I	7	Language	Tamil/OtherLanguages	6	4	25	75	100	30	40
	II	8	Language	Communicative English-II	6	4	25	75	100	30	40
	III	9	Core-IIPaper-III	Differential Equationsand Analytical GeometryofThree Dimensions	6	4	25	75	100	30	40
		10	Addon major(Mandatory)Paper-IV	ProfessionalEnglishforP hysicalsciences-II	4	4	25	75	100	30	40
		11	Allied-II(ForMath sStudents)	Statistics-II OR Physics with Practical /Chemistry with Practical /ComputerScience**	6	3	25	75	100	30	40
				Allied-II(For ScienceSt udents)	Vector Calculus &FourierSeries	6	4	25	75	100	30
	IV	12	Common	Valuebasededucation	2	2	25	75	100	30	40
Total					30	21/23					

**** The Allied Computer Science shall be taken by the Department of Mathematics**

Sem	Part	Sub. No.	Subject Status	Subject Title	Hrs/week	credits	Mark				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
III	I	13	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	14	Language	English	6	4	25	75	100	30	40
	III	15	CoreIII Paper-V	SequencesandSeries	6	4	25	75	100	30	40
		16	Allied-II	Statistics-I OR Physics with Practical / Chemistrywith Practical / Computer Science	6	3	25	75	100	30	40
		17	Skill Based Core	Vector Calculus	6	5	25	75	100	30	40
	IV	18	Non-Major Elective	Anyoneofthefollowing 1.1) Mathematics forCompetitiveExaminations-I 1.2) Fundamentals of Statistics-I	2	2	25	75	100	30	40
		19	Common	Yoga*	2	2	25	75	100	30	40
				Total	30	25/27					
IV	I	20	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	21	Language	English	6	4	25	75	100	30	40
	III	22	Core-IV Paper-VI	Abstract Algebra	6	4	25	75	100	30	40
		23	Allied-II	Statistics-II OR Physics with Practical / Chemistry with Practical/ Computer Science	6	3	25	75	100	30	40
		24	Skill Based Core	Trigonometry, Laplace Transforms and Fourier Series	6	5	25	75	100	30	40
	IV	25	Non-Major Elective	Anyone of the Following: 2.1) Mathematics for Competitive Examinations-II 2.2) Fundamentals of Statistics-II	2	2	25	75	100	30	40
		26	Common	Computers for Digital Era*	2	2	25	75	100	30	40
	V		Extension activities	NCC/NSS/YRC/YWF/PE	-	1	-	-	-	-	-
				Total	30	26/28					
V	III	27	Core-V Paper-VII	LinearAlgebra	5	4	25	75	100	30	40
		28	Core-VI	RealAnalysis	5	4	25	75	100	30	40

			Paper-VIII								
		29	Core-VII Paper-IX	Statics	5	4	25	75	100	30	40
		30	Core-VIII Paper-X	Integral Transforms and Z Transforms	5	4	25	75	100	30	40
		31	Major Elective-I Paper-XI	Anyone of the Following: 1.1) Programming in C 1.2) Discrete Mathematics 1.3) Combinatorial Mathematics	4	4	25	75	100	30	40
		32	Major Elective -II Paper-XII	Anyone of the Following: 2.1) Operations Research-I 2.2) Stochastic Process 2.3) Math Typing using LaTeX	4	4	25	75	100	30	40
	IV	33	Skill Based Common	Personality Development	2	2	25	75	100	30	40
			Total		30	26					
VI	III	34	Core-IX Paper-XIII	Complex Analysis	5	4	25	75	100	30	40
		35	Core-X Paper-XIV	Graph Theory	5	4	25	75	100	30	40
		36	Core-XI Paper-XV	Number Theory	4	4	25	75	100	30	40
		37	Core-XII Paper-XVI	Dynamics	4	4	25	75	100	30	40
		38	Core-XIII Paper-XVII	Numerical Methods	4	4	25	75	100	30	40
		39	Major Elective-III Paper-XVIII	Any one of the following 3.1) Astronomy 3.2) Fuzzy Mathematics 3.3) Mathematical Modeling	4	4	25	75	100	30	40
		40	Major Elective-IV Paper-XIX	Any one of the following 4.1) Operations Research-II 4.2) Coding Theory 4.3) Programming in C++	4	4	25	75	100	30	40
			Total		30	28					

SEMESTER-III
Non -Major Elective Paper I
Mathematics for competitive Examinations -I

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Non major-I		Mathematics for competitive Examinations -I	30	-	-	2

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	III	25	75	100

Objective: To learn the techniques for solving aptitude problems and to enable the students prepare themselves for various competitive examinations.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Interpret simplification and find averages	K1, K2
CO2	Determine ratio and proportion	K5
CO3	Assess partnership and solve percentage problems	K4,K5
CO4	Distinguish profit and loss	K4
CO5	Solve problems on numbers	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	3	2	3	3	1
CO3	2	3	2	3	2
CO4	3	1	3	2	2
CO5	1	1	1	3	2
Total contribution of COs to PSOs	12	10	12	14	10
Weighted Percentage of COs contribution to PSOs	80	66.67	80	93.33	66.67

Course Content

Unit -1:

Simplification,averages.

Unit -2:

Ratioand proportion.

Unit-3 :

Partnership-percentages.

Unit-4 :

Profit and Loss

Unit-5:

Problems on numbers.

Text Book:

- ❖ R.S.Agarwal -Objective arithmetic,Published by S.Chand& Co Ltd.Edition 2018

Book for References:

- ❖ R.S.Agarwal - Arithmetic subjective and Objective ,Published by S.Chand& Co Ltd. Revised Edition 1st April 2017
- ❖ Rajesh Verma,Fast track Objective arithmetic,Arihant Publications India Limited Fourth Edition,1st January 2018.

SEMESTER-III
Non -Major Elective Paper I
FUNDAMENTALS OF STATISTICS-I

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Non major-I		Fundamentals of Statistics-I	30	-	-	2

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	III	25	75	100

Objective: To introduce the new concept of Measure of Central Tendency to other major students .Also to study about correlation, regression and to solve simple problems.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Analyse the classification of datas.Also to construct bar diagram and Pie chart.	K3, K6
CO2	Illustrate measure of central tendency and to find mean,median and mode.	K1,K2
CO3	Explain the measure of dispersion .Also to find standard deviation,variance,quartile deviation and to obtain the relationship between them.	K4,K5
CO4	Interpret correlation and to solve rank correlation problems.	K2,K6
CO5	To find solution for regression equations	K1, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	3	2	3	3	1
CO3	3	3	3	3	3
CO4	3	2	3	3	2
CO5	1	2	2	1	2
Total contribution of COs to PSOs	13	12	14	13	11
Weighted Percentage of COs contribution to PSOs	86.67	80	93.33	86.67	73.33

Course Content

UNIT-1:

Classification of datas–BarDiagram–Pie chart.

UNIT-2:

Measures of central tendency: Mean, median, mode (with frequency).

UNIT-3:

Measures of dispersion: Range–standard deviation, Variance–Quartile deviation.

UNIT-4:

Correlation–Rank correlation (Problem only)

UNIT-5:

Regression equations (Problem only)

Text Book:

- Dr. S. Arumugam, A. Thangapandi Issac - Statistics, New Gamma Publishing House, Palayamkottai. (2016)

Books for Reference:

- S.P. Gupta - Elementary Statistical Methods, Sultan Chand & Sons, (2017).
- T. Veerarajan, Fundamentals of mathematical Statistics, Yes Dee Publishing Pvt, Ltd.. (2017)
- C.B. Gupta and Vijay Gupta, An Introduction to Statistical Methods, Vikas Publishing House Pvt. Ltd. New Delhi – (1973)

SEMESTER -IV
Non-Major Elective -II
MATHEMATICS FOR COMPETITIVE EXAMINATION-II

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Non Major		Mathematics for competitive examinations-II	30	-	-	4

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	IV	25	75	100

Objective: To learn the techniques for solving aptitude problems. Also to motivate the students for attending various competitive examinations.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Analyse and solve the problems based on simple interest and compound interest.	K2,K6
CO2	Apply short tricks on solving time and work problems	K3
CO3	Making use of the concept of time and distance while solving problems	K5
CO4	Utilize Chain rule	K4
CO5	Find solutions for pipes and Cistern problem	K1

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	2	2	3	3	3
CO3	3	3	2	2	2
CO4	3	2	3	2	3
CO5	3	3	1	3	3
Total contribution of COs to PSOs	14	13	12	13	14
Weighted Percentage of COs contribution to PSOs	93.33	86.67	80	86.67	93.33

Course Content:

UNIT-1:

Simple interest and Compound interest.

UNIT-2:

Time and work.

UNIT-3:

Time and Distance.

UNIT-4:

Chain Rule.

UNIT-5:

Pipes and Cistern

TextBook:

- ❖ R.S. Agarwal- Objective Arithmetic, Published by S. Chand & Co Ltd., Edition (2018).

Books for Reference:

- Rajesh Verma- Fasttrack Objective arithmetic, Arihant Publications (India) Limited., Fourth Edition 1st January 2018.
- R.S. Aggarwal, Arithmetic Subjective and Objective, Published by S. Chand and Co. Ltd. Revised Edition on 1st April 2017.

SEMESTER -IV
Non-Major Elective -II
FUNDAMENTALS OF STATISTICS-II

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Non Major		Fundamentals of Statistics-II	30	-	-	4

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	IV	25	75	100

Objective: To know the concept of attributes and to study the index numbers and simple problems.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Explain the theory of Attributes	K3
CO2	Illustrate about index numbers and to determine the weighted index numbers.	K1,K5
CO3	Analyse and predict consumer price index numbers	K6
CO4	Evaluate Time series	K4
CO5	Apply curve fitting for straight line ,parabola and exponential curve	K2

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	2	3	3	3	3
CO2	2	2	3	3	3
CO3	3	3	2	2	2
CO4	3	2	1	2	3
CO5	2	3	1	3	3
Total contribution of COs to PSOs	12	13	11	13	14
Weighted Percentage of COs contribution to PSOs	80	86.67	73.33	86.67	93.33

Course Content:

UNIT-I

Theory of attributes–two attributes.

UNIT –II

Index number –weighted index number.

UNIT – III

Consumer Price index number –conversion of index number.

UNIT –IV

Time series –measurement of trends.

UNIT–V

Curve fitting–Straight line –Parabola –Exponential curve.

TextBook:

- ❖ Dr. S. Arumugam, A.ThangapandiIssac- Statistics, New Gamma Publishing House,Palayamkottai (2016).

Books for Reference:

- S.P.Gupta-Elementary Statistical Methods,Sultan Chand & Sons,2017).
- T. Veerarajan Fundamentals of mathematical Statistics, YesDee Publishing Pvt.Ltd.Edition .(2017)

Semester-V

**Major Elective-I
PROGRAMMING IN C**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Non Major - I		Programming in C	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To study the basic concepts and structure of C program and to train the students to write simple C programs.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Summarize about character set. Classify the keywords and identifiers. Identify the constants, variables and data types.	K3,K4
CO2	Apply different types of operators and to make use of input and output operators.	K1,K6
CO3	Compile programs by utilizing decision making and branching statements. Also to apply Decision making and looping statements while develop a program.	K2,K5
CO4	Make use of one dimensional and two dimensional arrays. Also to utilize Character arrays and strings and its functions while compiling the program	K3,K6
CO5	Illustrate user defined functions and illustrate the definitions of functions and return values and their types. Also to categorize function call, function declaration.	K2,K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	2	2	2	3

CO2	2	3	3	3	2
CO3	2	3	2	2	3
CO4	2	2	3	3	3
CO5	2	2	2	3	3
Total contribution of COs to PSOs	11	12	12	13	14
Weighted Percentage of COs contribution to PSOs	73.33	80	80	86.67	93.33

Course Content

UNIT-1:

Introduction – Character set, C tokens ,keywords and identifiers, Constants ,Variables andDatatypes.

UNIT–2:

Operators – Arithmetic, relational, logical assignment, increment and decrement, Conditional,Bitwise special operators, Precedence of operators,Managing input and output operators – getchar(),putchar(),scanf()andprintf().

UNIT–3:

Decision making and branching-Simple if, if else, nested if and the else if ladder statements, The switch statement,The ?: operator, The goto statement. Decision making and looping-while,Dowhile andforstatement,jumpsinloops.

UNIT–4:

Onedimensionalandtwodimensionalarrays–declaration,initializationofarrays, Multidimensionalarrays,Characterarraysandstrings:Declaringandinitializingstringvariables,Readingandwrittingofstrings,stringhandlingfunctions.

UNIT–5:

Userdefinedfunctions–

Definitionoffunction,returnvaluesandtheirtypes,functioncalls,functiondeclaration,Categoryoffunctions,Nestingoffunctions,recursion.

TextBook:

- ❖ E. Balaguruswamy - Programming in ANSI C –Tata McGraw Hill Publishing company limited – III Edition(2017).

Booksforreferences:

- C. ReemaThareja,ProgramminginC- OxfordUniversityPress(2018).
- Ramasamyet.al.-Programmingin C-ScetechPublication(INDIA)Pvt.Ltd.IIEdition(2015).
- AshokN.Kamathane- ProgrammingwithAnsiandTurboC– DorlingKindersley(India)Pvt.Ltd,(2009).

Semester-V

**Major Elective-I
DISCRETE MATHEMATICS**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Non Major - I		Discrete Mathematics	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To study concepts of mathematical logics and to understand the basics of Lattices and Boolean Algebra.

Course Outcomes: On successful completion of the course,the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate and use the statements,notations and connectives .Construct truth table and utilize conditional and biconditional statements.	K2,K3
CO2	Analyze and explain Predicate calculus	K1,K4
CO3	Elaborate Groups and monoids. Also to develop Group codes	K6
CO4	Construct Lattices and special lattices.Analyze and explain Boolean algebra	K5
CO5	Convert From one form to another form (Decimal,Binary,Octal,Hexadecimal). Evaluate Binary addition,subtraction multiplication and division.	K2,K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	2	3	1	3
CO2	3	3	3	3	2
CO3	3	3	2	1	3
CO4	2	3	3	3	3

CO5	1	3	2	3	2
Total contribution of COs to PSOs	12	14	13	11	13
Weighted Percentage of COs contribution to PSOs	80	93.33	86.67	73.33	86.67

Course Content

UNIT–1: Mathematical logic – Statements and notation, Connectives, Negation, Conjunction, Disjunction, Statement formula and truth table, Conditional and biconditional statements. Well defined formulae, tautologies.

UNIT–2: Normal forms - The theory of interference for the statement calculus, The Predicate, Theory of inference for the Predicate Calculus.

UNIT–3: Algebraic structures - Groups and monoids, Simple properties, Group codes.

UNIT–4: Lattices and Boolean algebra - Lattices as posets, Properties of lattices, special lattices, Boolean algebra, Gating networks, Minimal sum of products.

UNIT–5: Number system and codes - Decimal, Binary, Octal, Hexadecimal – Conversion from one to another – Binary addition, subtraction, multiplication and division, BCD, Weighted excess time, Gray code.

Text Book:

- ❖ J.P. Tremblay and Manohar - Discrete mathematical structures with application to Computer Science (Tata McGraw Hill) New Delhi, 43rd edition 2013.

Books for Reference:

- M. K. Venkataraman and others – Discrete mathematics - The National Publishing Pvt. Ltd. (2000).
- G. Balaji – Discrete mathematics – Balaji Publishers Chennai (2013).
- T. Veerarajan – Discrete mathematics Tata McGraw Hill – 2009.
- Garrett Birkhoff - Lattice Theory, American Mathematical Society (1948).
- M.K. Sen, B.C. Chakraborty, Introduction to Discrete Mathematics, Books and Allied (P) Ltd (2009).

Semester-V

**Major Elective-I
COMBINATIONAL MATHEMATICS**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Non Major - I		Combinational Mathematics	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To know the basic concepts of pairings and to understand relations

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Explain Selections and to find binomial coefficients. Classify ordered selections and unordered selections.	K1, K3
CO2	Solve pairing problems	K3
CO3	Explain recurrence and classify the types of relations using generating functions.	K2, K5
CO4	Illustrate The inclusion and exclusion principles.	K4, K6
CO5	Construct and solve block designs and square block designs.	K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	2	1	2	3	1
CO3	2	2	2	1	2
CO4	2	1	1	3	1
CO5	1	3	2	3	1

Total contribution of COs to PSOs	10	9	10	11	8
Weighted Percentage of COs contribution to PSOs	66.67	60	66.67	73.33	53.33

Course Content

UNIT-1:

Selections and Binomial coefficients–Permutations–Ordered selections–unordered selections–Miscellaneous Problems.

UNIT-2:

Parings Problems–Pairings within a set–Pairing between sets.

UNIT-3:

Recurrence–Fibonacci–type relations using generating functions–Miscellaneous methods.

UNIT-4:

The Inclusion–Exclusion Principles.

UNIT-5:

Block designs–square block designs.

TextBook:

- ❖ Ian C. Andersen–A first course in combinatorial mathematics –Clarendon Press, Oxford(1989).

Books for Reference:

- Ralph P. Grimaldi, B. V. Ramana –Discrete and combinatorial mathematics–an applied introduction (IV edition).

Semester-V

**Major Elective-I
OPERATIONS RESEARCH -I**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major elective		Operations Research-I	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To introduce the various techniques of operations research

Course Outcomes: On successful completion of the course,the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Solve Linear Programming Problem by making use of Graphical method,Simplex method.	K4
CO2	Interpret the concept of duality.Classify primal and dual problems.Utilizing the concept of duality ,solve problems on dual simplex method.	K3
CO3	Solve Transportation problems by making use of North – west corner rule,Matrix-Minima method,Vogel’s Approximation rule. Evaluate Degeneracy and unbalanced transportation problems.	K2,K5
CO4	Determine the solution for Assignment problems.	K1,K6
CO5	Solve sequencing problems.	K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5

Cos					
CO1	3	3	3	1	3
CO2	2	1	2	3	3
CO3	2	1	2	3	2
CO4	2	3	1	3	3
CO5	3	3	2	3	3
Total contribution of COs to PSOs	12	11	10	13	14
Weighted Percentage of COs contribution to PSOs	80	73.33	66.67	86.67	93.33

Course Content

UNIT-1:

Linear Programming Problem: Mathematical formulation of LPP–Graphical method, Simplex method–Artificial variable technique.

UNIT-2:

Concept of Duality–Primal and Dual problems–Duality–Dual Simplex method.

UNIT-3:

Transportation Problem: North-west Corner rule–Matrix-Minima method–Vogel’s approximation method–MODI method–Degeneracy and unbalanced Transportation problem.

UNIT-4:

Assignment Problem: Hungarian method –Unbalanced assignment problems.

UNIT-5:

Sequencing Problem: n jobs and two machines – n jobs and three machines – 2 jobs and m machines.

TextBook:

- ❖ Kanti Swarup, P. K. Gupta and Manmohan – Operations Research – Sultan Chand and sons, (New Delhi) 12th edition (2006)

Books for Reference:

- Gupta P. K. and D. S. Hira – Operations Research – S. Chand & Sons Reprint (2012).
- B. J. Ranganathan and A. S. Srikantappa – Operations Research – Yes Dee Publishing House, Chennai (2017).
- Hamdy A. Taha – Operations Research, An Introduction - 8th Edition Prentice–Hall India (2006).
- A. C. S. Kumar, Operation Research, Yes Dee Publications, Chennai, 3rd Reprint 2019.

Semester-V

**Major Elective-I
STOCHASTIC PROCESS**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective		Stochastic Process	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To understand the concepts of stochastic process and understand the generalization of Poisson process

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Determine the generating functions .Also to analyze and explain Stochastic Process and specification of stochastic process	K1,K3
CO2	Interpret Markov Chains .Also to analyze the classification of states and chains.Illustrate the stability of Markov chain.	K2,K4
CO3	Classify Markov chain with denumerable states and Markov chain with continuous state space.	K2,K5
CO4	Illustrate Markov Process with discrete state space by using Poisson Process.	K1,K6
CO5	Elaborate Erlang Process.	K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	1	3
CO2	2	1	2	3	3

CO3	1	1	2	3	2
CO4	2	3	1	3	3
CO5	3	3	2	3	2
Total contribution of COs to PSOs	11	11	10	13	13
Weighted Percentage of COs contribution to PSOs	73.33	73.33	66.67	86.67	86.67

Course Content:

UNIT-1:

Generating functions–Laplace transform of probability distribution, Classification of distribution, Stochastic process, specification of stochastic process.

UNIT-2:

Markov chains – Definition and examples , Higher transition probabilities ,Generalisation of independent Bernoulli Trails, classification of states and chains ,Determination of Higher Transition Probabilities– stability of Markov systems.

UNIT-3:

Markov chain with Denumerable number states – Reducible chains ,Statistical inference for Markov chains, Markov chain with continuous state space, Non homogeneous chains.

UNIT-4:

Markov process with discrete state space–Poisson process, Poisson process and related distributions, Generalisation of Poisson process,Birth and Death process.

UNIT-5:

Markov process with Discrete state space–Derived Markov chains, Erlang Process.

TextBook:

- ❖ J.Medhi–Stochastic Process–New Age International Publishers Pvt.Ltd.Third Edition. 2009.

Books for Reference:

- SuddhenduBiswas – Applied Stochastic Process – New Central Agency Pvt. Ltd.,Kolkatta(2012).
- PaulG.Hoel,SidneyPort&CharlesJ.Stone–IntroductiontoStochasticprocess–WavelandPress–Boston(1987).
- V.Thangaraj, Stochastic Process and their applications,New Age International Publishers,NewDelhi,First Edition (1995).

Semester-VI

**Major Elective- IV
MATH TYPE USING LATEX**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-IV	Major Elective		Math Type using Latex	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce coding and decoding concepts. Also to develop the students in the field of coding theory

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Type words, sentences and symbols not in the keyboard using Tex	K1,K3
CO2	Analyze Text environments	K2,K4,K5
CO3	Type math by making use of spacing rules, equations	K5
CO4	Type spacing of symbols building new symbols, math alphabets and symbols	K2,K6
CO5	Write latex documents by making use of abstract, sectioning, cross referencing and Bibliographies.	K4

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	1	3	3	3	3
CO2	2	1	3	2	1

CO3	2	1	2	3	2
CO4	3	2	3	3	1
CO5	3	3	3	3	3
Total contribution of COs to PSOs	11	10	14	14	10
Weighted Percentage of COs contribution to PSOs	73.33	66.67	93.33	93.33	66.67

Course Content:

Unit-I

Typing text: Words, sentences and paragraphs-symbols not on the keyboard-comments and footnotes-Changing font Characteristics-Lines, paragraphs and pages-spaces- Boxes.

(Chapter 5, section 5.1 to 5.9, pages 61 to 115)

Unit-II

Text environments: some general rules for displayed text environments-List of environments-style and size environments-proclamations(theorem-like structures)-Proof environments-Tabular environments-Tabbing environments-Miscellaneous displayed text environments.

(Chapter 6, section 6.1 to 6.8, pages 117 to 149)

Unit-III

Typing math: Math environments-spacing rules-equations--spacing rules-equations-Basic constructs-Arithmetic operations-Delimiters-Operators-Math accents-Stretchable horizontal lines-formula gallery.

(Chapter 7, section 7.1 to 7.9, pages 151 to 186)

Unit-IV

More math: Spacing of symbols building new symbols-math alphabets and symbols-vertical spacing-Tagging and grouping-Generalized fractions-Boxed formulas.

(Chapter 8, section 8.1 to 8.6, pages 187 to 206)

Unit-V

Latex documents: The structure of a document-The preamble-Abstract-Sectioning-Cross referencing-Bibliographies.

(Chapter 10, section 10.1 to 10.6, pages 245 to 270)

Text Book:

- ❖ George Gratzer, More Math into LaTeX, 4th edition, Springer, 2007.

Books for Reference:

- Helmut Kopka and Patric W. Daly, A guide to LaTeX, Fourth edition, Addison-Wesley.
- David R. Wilkins, Getting started with LaTeX, Second Edition.

Practical:

Typing texts and Tables: Chapter 4.1- Inserting Figures Chapter 5.1-Mathematical Equations: Chapter 6.3- Inserting references: Chapter 7.6-Preparing an article for mathematical journal.

Semester-VI

Major Elective- III
ASTRONOMY

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective- III		Astronomy	60	-	-	4

Contact hours per semester: 60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce the exciting world of Astronomy to students and to understand the movements of the celestial sphere.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Explain Spherical Trigonometry .Also to elaborate the fundamental of spherical trigonometry, the sine, the cosine, four parts and Napier's formula.	K3,K5
CO2	Imagine the celestial sphere, Illustrate about the rising and setting of a star. Identify and Classify circumpolar stars and morning, evening stars.	K1,K4
CO3	Imagine Earth and to explain refraction. Deduce Tangent formula and Cassini's formula.	K2,K6
CO4	Illustrate Geocentric parallax and Heliocentric parallax	K3,K5
CO5	Elaborate Kepler's laws. Also to classify True anomaly, mean anomaly and eccentric anomaly and to obtain the relationship between them.	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	2	3	3	3	3
CO2	2	2	3	3	1
CO3	2	3	2	3	2
CO4	2	2	2	3	2
CO5	2	1	2	2	3
Total contribution of COs to PSOs	10	11	12	14	11
Weighted Percentage of COs contribution to PSOs	66.67	73.33	80	93.33	73.33

Course Content

UNIT-1:

Spherical Trigonometry: Spherical triangle – The fundamental formulae of Spherical trigonometry, the sine, cosine, four parts and Napier formula (without proof) and simple problems.

UNIT-2:

The Celestial Sphere: Celestial co-ordinates – Diurnal motion – Rising and setting of a star sidereal time – circumpolar stars – Morning and evening stars – Twilight.

UNIT-3:

Earth – length of a day – Refraction – Tangent formula – Cassini's formula – Effects of refraction.

UNIT-4:

Geocentric parallax – Effects – Heliocentric parallax – Effects.

UNIT-5:

Kepler's laws – verification of Kepler's laws – True anomaly, mean anomaly, Eccentric anomaly – Relation between them.

Text Book:

- ❖ Kumaravelu. Sand Susheela Kumaravelu – Astronomy for degree classes, Rainbow Printers, Nagercoil (2005).

Book for Reference:

- Ramachandran. G. V – Astronomy, Mission Press, Palayamkottai, 1965.

Major Elective- III FUZZY MATHEMATICS
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Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -III		Fuzzy Mathematics	60	-	-	4

Contact hours per semester:60

Contact hours per week :4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce fuzzy concepts to students and to facilitate the student to study fuzzy operations and fuzzy numbers

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Explain Crisp sets and fuzzy sets and illustrate the characteristics and significance of Paradigm Shift.	K1,K2
CO2	Elaborate the Additional properties of α cuts and the extension principle for fuzzy sets.	K1,K4
CO3	Perform fuzzy set operations. Also to determine fuzzy complements, fuzzy intersections and fuzzy unions.	K5,K6
CO4	Determine fuzzy numbers and Linguistic variables. Apply arithmetic operations on intervals and on fuzzy numbers. Construct lattice of fuzzy numbers.	K2,K3,K4
CO5	Analyze and classify fuzzy decision making, individual decision making, Multi person decision making problems.	K5,K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	2	3	3	3	3
CO2	2	1	3	3	1
CO3	2	1	2	3	2
CO4	1	2	2	3	2
CO5	2	2	1	2	3
Total contribution of COs to PSOs	9	9	11	14	11
Weighted Percentage of COs contribution to PSOs	60	60	73.33	93.33	73.33

Course Content

UNIT-1:

Crisp Sets–Fuzzy Sets–Basic Types–Basic Concepts–Characteristics and Significance of Paradigm Shift.

UNIT-2:

Additional properties of α -cuts– representations of fuzzy sets– Extension principle for fuzzy sets.

UNIT-3:

Fuzzy set operations–Fuzzy complements–Fuzzy intersections:t-norms–Fuzzy Unions:t-conorms –Combinations of operations.

UNIT-4:

Fuzzy numbers – linguistic variables-arithmetic operations on intervals-arithmetic operations on fuzzy numbers-Lattice of fuzzy numbers-Fuzzy Equations.

UNIT-5:

Fuzzy decision making – Individual Decision Making-Multi-person decision making-fuzzy linear programming.

Text Book:

- ❖ George J. Klir and Bo Bo Yuan–
Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, 2002, New Delhi.

Book for Reference:

- George J. Klir and Tina A. Folger–Fuzzy sets, uncertainty and Information – Prentice Hall of India, 2003, New Delhi.

Semester-VI

**Major Elective- III
MATHEMATICAL MODELLING**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -III		Mathematical Modelling	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To study the mathematical models through ODE and difference equations.

Course Outcomes: On successful completion of the course,the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate mathematical modelling through ODE. Classify and elaborate linear growth , non-linear and growth decay problems,Compartmentmodels,Dynamic problems and geometrical problems.	K1,k2
CO2	Explain population dynamics, Epidemics.Anlayze the compartment models in economics,medicines,arms race bullets and international trade.	K2,K3,K5
CO3	Explain mathematical modelling problem through second order ODE.	K5,K6
CO4	Illustrate mathematical modelling through difference equation.	K2,K6
CO5	Explain mathematical modelling through graphs.	K3,K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	2	3	3	3	3
CO2	2	1	3	3	1
CO3	2	1	2	3	2
CO4	2	2	2	3	1
CO5	2	2	1	1	3
Total contribution of COs to PSOs	10	9	11	13	10
Weighted Percentage of COs contribution to PSOs	66.67	60	73.33	86.67	66.67

Course Content

UNIT-1:

(Mathematical modeling through O.D.E(First order)): Linear growth and Decay models –Non –linear growth and Decay models – Compartment Models –Dynamics Problems–GeometricalProblems.

UNIT-2:

Population dynamics – Epidemics – Compartment Models – Economics, Medicine, Arms race, Battles and International Trade.

UNIT-3:

(Mathematical Modelling through O.D.E. (Second order)): Planetary motion – circular motion – Motion of satellites – Modelling through linear difference equations of second order.

UNIT-4:

(Mathematical Modelling through difference equations): Basic theory of difference equation with constant coefficients – Economics and Finance – Population dynamics and genetics – Probability theory.

UNIT-5: (Modelling through graphs): Solutions that can be modeled through graphs – models in terms of directed graphs, signed graphs, weighted digraphs and unoriented graphs.

Text Book:

- ❖ Kapur, J.N – Treatment as in “Mathematical Modelling” New Age International Publishers, 2004.

Books for Reference:

- Kapur, J.N – Mathematical Modelling in Biology and Medicine – East West Press – 1985.
- Singh – Mathematical Modelling, International Bookhouse – 2003.
- Frank R. Giordano, Maurice D. Weir and William P. Fox, - A first course in mathematical modelling, Thomson Learning, London and New York, 2003.
- Kapur, J.N, Mathematic modeling, New Age International Pvt., Ltd., Reprint (2007).

Semester-VI

**Major Elective- IV
OPERATIONS RESEARCH-II**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -III		Operations Research	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce games and strategies. Also to understand networking problems.

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Interpret the games and strategies. Solve two persons zero sum games. Make use of mixed strategies and dominance property.	K2,K3
CO2	Analyze the replacement of items that deteriorate with time. Illustrate replace montage of a machine taking money value into consideration and elaborate the replacement of items that completely fail suddenly and Staffing problems.	K1,K5
CO3	Explain the queueing models and to classify into (M/M/1:FCFS), (M/M/1:∞/FCFS), (M/M/S:/FCFS)	K4,K6
CO4	Compose network scheduling using PERT/CPM. Explain the rules of network construction. Make use of PERT calculation.	K2,K3
CO5	Analyse and solve inventory control problems.	K5,K6

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	2	3	3	2	3
CO2	2	1	3	2	1
CO3	2	1	2	2	2
CO4	2	2	2	2	1
CO5	1	2	1	1	3
Total contribution of COs to PSOs	9	9	11	9	10
Weighted Percentage of COs contribution to PSOs	60	60	73.33	60	66.67

UNIT-1:

Games and Strategies: Two Person Zero sum Games – The Maximin – Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphical Solution of $2 \times n$ and $m \times 2$ games – Dominance Property.

UNIT-2:

Replacement of items that deteriorate with time – replace montage of a machine taking money value into consideration – replacement of items that completely fail suddenly and Staffing Problems.

UNIT-3:

Queueing models: General concept and definitions – characteristics – properties of Poisson process Models ($M/M/1:FCFS$), ($M/M/1:\infty/FCFS$), ($M/M/S:FCFS$).

UNIT-4:

Networks Scheduling by PERT/CPM: Network and basic components – Rules of Network Construction – Time Calculation in network – Critical Path Method – PERT Calculation.

UNIT-V:

Inventory Control : Introduction – Types of Inventories – Inventory decisions – Deterministic inventory Problem – EOQ problems without shortages.

Text Book:

- ❖ Kanti Swarup, P.K. Gupta and Manmohan – Operations Research – Sultan Chand & Sons – 2006, 12th Edition.

Books for Reference:

- Gupta, P.K. and D.S. Hira – Operations Research – S. Chand & Sons – VII Edition.
- B.J. Ranganath and A.S. Srikantappa – Operations Research, Yes Dee Publishing House, Chennai (2017).
- Hillier, F.S. and G.J. Lieberman – Introduction to Operations Research, 9th Ed., Tata McGraw Hill, Singapore, 2009.
- Hamdy A. Taha, -Operations Research, An Introduction, 8th Ed., Prentice-Hall India, 2006.
- Hadley, G. - Linear Programming, Narosa Publishing House, New Delhi, 2002.

Semester-VI

**Major Elective-IV
CODING THEORY**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -IV		Coding Theory	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce coding and decoding concepts. Also to develop the students in the field of coding theory

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Analyze and illustrate basic assumptions and correcting, detecting error patterns. Also to interpret effects of error correction and detection.	K3, K4
CO2	Elaborate linear codes and illustrate the bases for C and C ⁺ generating matrices on coding	K1, K2
CO3	Illustrate parity check matrices and determine the equivalent codes	K3, K5
CO4	Explain some bounds for codes and classify perfect codes, hamming codes, extended codes, the extended Golay code and decode them.	K4, K6
CO5	Summarize about polynomials and words, cyclic codes. Make use of polynomial encoding and decoding	K6

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	1	3	3	2	3
CO2	2	1	3	2	1
CO3	2	1	2	2	2
CO4	2	2	3	2	1
CO5	3	2	3	2	3
Total contribution of COs to PSOs	10	9	14	10	10
Weighted Percentage of COs contribution to PSOs	66.67	60	93.33	66.67	66.67

Course Content:

UNIT -1:

Introduction to coding theory, Basic assumptions, Correcting and detecting error patterns – information rate – effects of error correction and detection – finding the most likely code word transmitted.

UNIT-2:

Linear codes – subspaces independence – basis, dimension – matrices – Bases for C and C^+ generating matrices on coding.

UNIT-3:

Parity check matrices – equivalent codes – distance of a linear code – Linear codes – cosets – MLD for linear codes – Reliability of MLD for linear codes.

UNIT-4:

Some bounds for codes – perfect codes – hamming codes – extended codes – The extended Golay code – decoding the extended Golay code – Golay code.

UNIT-5:

Polynomial and words – introduction to cyclic codes – Polynomial encoding and decoding – finding cyclic codes – Dual cyclic codes.

Text Book:

- ❖ Coding theory, The essentials – Marcel Dekker, Inc. Madison Avenue, New York.

Books for Reference:

- Elwyn Berlekamp – Algebraic Coding Theory – Springer-1970
- San Ling and Chaoping Xing, coding theory A first course, Cambridge University Press, New York (2004)

Semester-VI

**Major Elective-IV
PROGRAMMING IN C++**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -IV		Programming in C++	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce coding and decoding concepts. Also to develop the students in the field of coding theory

Course Outcomes: On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate and make use of the concepts of tokens, expressions and control structures	K3,K4
CO2	Utilize the functions in C++ and to apply it while writing programs	K1,K2
CO3	Interpret constructors and destructors	K3,K5
CO4	Explain and apply operator overloading while writing programs	K4,K6
CO5	Make use of inheritance and classes to compile a program	K6

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	1	3	3	2	3
CO2	2	1	3	2	1
CO3	2	2	2	2	2
CO4	2	3	3	2	3
CO5	2	3	3	2	3
Total contribution of COs to PSOs	9	12	14	10	12
Weighted Percentage of COs contribution to PSOs	60	80	93.33	66.67	80

Course Content:

Unit-I: Tokens, Expressions and control structures

Introduction, Tokens, Keywords, Identifiers and constants, Basic data types, User defined data types, storage classes, Derived data types, Symbolic constants.

UNIT-II: Functions in C++

Introduction, The main function, function prototyping, Call by reference, Return by references, Inline functions, Default arguments, constant Arguments, Recursion, Function overloading, Friend and virtual functions, Math library functions, C structures Revisited, Specifying a class, Defining member functions, A C++ program with class, Making an outside functions inline, Nesting member functions, Private member functions, Arrays within a class, Memory allocation for objects, Static member functions, Array of objects, objects as function arguments, Friend functions, Returning objects.

UNIT-III: Constructors and Destructors

Introduction, Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, , Constructing Two-dimensional arrays, constant objects, Destructors.

UNIT-IV: Operator Overloading and Type Conversations

Introduction, Defining operator overloading, Overloading unary operator, Overloading Binary operator, Overloading Binary operators using Friends, Manipulation of strings using operators, Some other operator overloading examples, Rules for Overloading Operators

UNIT-V: Inheritance: Extending Classes

Introduction, Defining Derived classes, Single inheritance, Making a private member inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.

Text Book:

- ❖ E. Balaguru Samy, Object Oriented Programming with C++, Tata McGraw Hill Education Private Limited, New Delhi (Fifth Print 2012).

Book for References :

- Reema Thareja, Object Oriented Programming with C++, Oxford University Press (January 2018)

PROGRAMME STRUCTURE

Semester	Class	Paper	Allotted Hours	Credits
I	I M.Sc. Mathematics	Core – 1, Algebra - I	6	4
		Core – 2, Analysis – I	6	4
		Core – 3, Analytic Number Theory	6	4
		Core – 4, Operations Research	6	4
		Core – 5, Ordinary Differential Equations	6	4
II	I M.Sc. Mathematics	Core – 6, Algebra - II	5	4
		Core – 7, Analysis – II	5	4
		Core – 8, Advanced Calculus	5	4
		Core – 9, Differential Geometry	5	4
		Core – 10, Research Methodology and Statistics	5	4
		<u>Elective – 1 (Choose any one) :</u> 1.1. Classical Mechanics 1.2. Partial Differential Equations 1.3. Python Programming-Theory	5	4
III	II M.Sc. Mathematics	Core – 11, Advanced Algebra – I	6	4
		Core – 12, Graph Theory	6	4
		Core – 13, Measure and Integration	6	4
		Core – 14, Topology - I	6	4
		<u>Elective – 2 (Choose any one):</u> 2.1. Algebraic Number Theory 2.2. Calculus of Variation and Integral Equations 2.3. Python Programming-Practicals	6	4
IV	II M.Sc. Mathematics	Core – 15, Advanced Algebra -II	5	4
		Core – 16, Complex Analysis	5	4
		Core – 17, Functional Analysis	5	4
		Core – 18, Topology - II	5	4
		Core – 19, Project	10	10
		Total	120 hrs.	90

- In Elective- 1, if 1.3. Python Programming-Theory is chosen then in Elective-2, 2.3. Python Programming-Practicals is Compulsory.
- Project credit is increased to create awareness on Research among students.

Title of the Course : **CLASSICAL MECHANICS** (75 Hours)

Course Objective : To illustrate Mechanics of a system of particle, Hamilton principle and Kepler problem

Course Outcomes(COs)

On successful completion of the course, the students will be able to

	Course outcome	Cognitive Level
CO 1	Distinguish between the external force acting on the particles due to sources outside the system and internal forces on all other particles in the system.	K-2, K-3
CO 2	Work with many vector forces and accelerations and deal with two scalar functions.	K-3
CO 3	Emphasize that configuration space has no necessary connection with the physical three-dimensional space. extend Hamilton's principle to cover certain types of nonholonomic systems.	K-4
CO 4	Discuss the problems of two bodies moving under the influence of a mutual central force as an application of the Lagrangian formulation.	K-3
CO 5	Solve the orbital equation for motion in a central inverse-square force law in a fairly straightforward manner with results that can be stated in simple closed expressions.	K-4, K-5

K-1: Remembering; K-2: Understanding; K-3: Applying; K-4: Analyzing; K-5: Evaluating; K-6:Creating.

L	T	C	P
5	0	4	0

Course Description

- Unit I:** Mechanics of particles– Mechanics of a system of particle constraints.
Chapter 1: Section 1 - 3, Problems: 2, 4 and 5. (15 hours)
- Unit II:** D'Alembert's Principle and Lagrange's Equation – Velocity dependent potentials and dissipation functions – Simple applications of Lagrangian formulation.
Chapter 1: Section 4, 5 and 6, Problems: 11, 13 and 17. (15 hours)
- Unit III:** Hamilton's Principle – Some techniques of Calculus of Variation –Derivation of Lagrange's equations from Hamilton's principle – Extension of Hamilton principle to non-holonomic systems.

Chapter 2: Section 1 – 4, Problems: 1 – 3. (15 hours)

Unit IV: Reduction to the equivalent one-body problem – The equations of motion and first Integrals – The equivalent one-dimensional problem and classification of orbits – The virial theorem.

Chapter 3: Section 1 – 4, Problems: 2 – 4. (15 hours)

Unit V: The differential equation for the orbit and integrable power law potentials – The Kepler problem: Inverse square law of force – The motion in time in the Kepler problem – The Laplace – Runge – Lenz vector.

Chapter 3: Section 5, 7 – 9. (15 hours)

Text Book: Classical Mechanics, H. Goldstein, Second Edition, Addison Wesley India Edition.

Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	3	3	2	2	3
CO 3	2	3	2	3	2	3	3	3	3	3
CO 4	2	3	3	3	2	3	3	3	2	3
CO 5	2	3	3	3	2	3	3	2	2	3

Strongly Correlated-3; Moderately Correlated-2; Weakly Correlated-1; No Correlation-0

Title of the Course : **PARTIAL DIFFERENTIAL EQUATIONS** (75 Hours)

Course Objective : To analyse various methods of solutions of Partial differential equation, Cauchy's Method and Separation of variables

Course Outcomes(COs)

On successful completion of the course, the students will be able to

	Course outcome	Cognitive Level
CO 1	Find the fundamental difference between Pfaffian differential equations in two variables and those in a higher number of variables.	K-3, K-4
CO 2	Find the general solution of a linear partial differential equation and indicate how such a general solution may be used to determine the integral surface which passesthrough a given curve.	K-4, K-5
CO 3	Able to solve the nonlinear partial differential equation.	K-5
CO 4	Able to solve linear partial differential equations of the second order.	K-5
CO 5	Able to extend the characteristic curves of a second - order linear differential equation in two independent variables to the case where there are n independent variables.	K-3, K-4

K-1: Remembering; K-2: Understanding; K-3: Applying; K-4: Analyzing; K-5: Evaluating; K-6:Creating.

L	T	C	P
5	0	4	0

Course Description

Unit I: Methods of Solution of $\frac{dx}{P} + \frac{dy}{Q} + \frac{dz}{R}$ – Pfaffian Differential Forms and Equations- Solution of Pfaffian Differential Equations in three variables.
Chapter 1: Section: 3, 5 and 6 (all problems) (15 hours)

Unit II: Partial Differential equations – Origins of first order Partial Differential equations –Linear equations of the first order –Integral surfaces passing through a given curve.
Chapter 2: Section: 1, 2, 4 and 5 (all problems) (15 hours)

Unit III: Cauchy's Method of Characteristics – Compatible systems of First order Equations –Charpit's Method.
Chapter 2: Section: 8 – 10 (all problems) (15 hours)

Unit IV: Second order equations in Physics – Linear Partial Differential equations with Constant Coefficients.
Chapter 3: Section: 2 and 4 (all problems) (15 hours)

Unit V: Characteristics of Equations in three variables – Separation of variables.
Chapter 3: Section: 7 and 9 (all problems) (15 hours)

Text Book: Elements of Partial Differential Equations, IAN N. SNEDDON, McGraw Hill, New Delhi, 1983

Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	3	3	2	2	3	2	2	3
CO 2	3	3	2	2	3	3	3	2	2	3
CO 3	3	3	2	3	2	2	3	3	2	2
CO 4	2	2	3	3	3	2	2	2	3	2
CO 5	3	3	2	2	3	2	2	3	2	3

Strongly Correlated-3; Moderately Correlated-2; Weakly Correlated-1; No Correlation-0

Title of the Course : **PYTHON PROGRAMMING** (75 Hours)

Course Objective : To demonstrate Problem Solving Techniques, Algorithmic Problem Solving , Python introduction and Python functions.

Course Outcomes(COs)

On successful completion of the course, the students will be able to

	Course outcome	Cognitive Level
CO 1	Give mathematical model for real world problems	K-1, K-2
CO 2	Design algorithms for mathematical models, analyse the efficiency and correctness of algorithms.	K-4
CO 3	Design implementable programs in Python.	K-5
CO 4	Define and demonstrate the use of functions and looping using Python.	K-3
CO 5	Design and implement a program to solve a real-world problem.	K-5

K-1: Remembering; K-2: Understanding; K-3: Applying; K-4: Analyzing; K-5: Evaluating; K-6:Creating.

L	T	C	P
5	0	4	0

Course Description

Unit I: PROBLEM SOLVING TECHNIQUES

Problem solving Techniques – Algorithm, flowchart, pseudocode, programming; Algorithms: properties, quality (time, space); building blocks of algorithms - statements, state, control flow, functions, notation (pseudo code, flow chart, programming language) (15 hours)

Unit II: ALGORITHMIC PROBLEM SOLVING

Algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion), pseudocode for some Mathematical Problems – greatest of two numbers, print n natural numbers, greatest common divisor, fibonacci sequence upto n terms. Practical applications of algorithms. (15 hours)

Unit III: INTRODUCTION TO PYTHON

Introduction to Python, Python interpreter, Modes of Python Interpreter, Values and Data Types, Variables, Keywords, Identifiers, Statements and Expressions, Input and Output, Comments, Docstring, Lines and Indentation, Quotation, Tuple Assignment, Operators and Types of Operators, Operator Precedence. (15 hours)

Unit IV: PYTHON FUNCTIONS

Functions, Types of function, Function definition (Sub program), Flow of Execution, Function Prototypes, Parameters and Arguments; Modules; Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion. (15 hours)

Unit V: STRING, LISTS, TUPLES IN PYTHON

Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value. (15 hours)

Text Book:

Allen B. Dowley, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition.

Reference Books:

1. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython”, O’Reilly, 2nd Edition, 2018.
2. Jake VanderPlas, “Python Data Science Hand Book: Essential Tools for working with Data”, O’Reilly, 2017.
3. Wesley J. Chun, “Core Python Programming”, Prentice Hall, 2006.
4. Mark Lutz, “Learning Python”, O’Reilly, 4th Edition, 2009.

E-Books:

- <http://www.programmer-books.com/introducing-data-science-pdf/>
<http://www.CS.uky.edu/~keen/115/haltermanpythonbook.pdf>
[http://math.ecnu.edu.cn/~lfzhou/seminar/IJoel Geusi Datascience from Scratch First Princ.pdf](http://math.ecnu.edu.cn/~lfzhou/seminar/IJoel_Geusi_Datascience_from_Scratch_First Princ.pdf)

Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	3	3	2	3	3	3	3	3
CO 2	3	2	3	3	2	3	3	3	3	3
CO 3	3	2	3	3	3	3	3	3	3	3
CO 4	3	2	3	3	3	3	3	3	3	3
CO 5	2	2	2	3	3	3	3	3	3	3

Strongly Correlated-3; Moderately Correlated-2; Weakly Correlated-1; No Correlation-0

Title of the Course : **ALGEBRAIC NUMBER THEORY** (90 Hours)

Course Objective : To appreciate the significance of approximating irrational numbers, acquired the knowledge of Unique factorizations

Course Outcomes(COs)

On successful completion of the course, the students will be able to

	Course outcome	Cognitive Level
CO 1	Demonstrate competence with the basic ideas of Diophantine and other linear equations.	K-2
CO 2	Solve some special equations of the type $x^4+y^4=z^2$	K-3
CO 3	Able to demonstrate about infinite continued functions	K-3
CO 4	Appreciate the significance of approximating irrational numbers	K-3
CO 5	Acquired the knowledge of Unique factorizations	K-3

K-1: Remembering; K-2: Understanding; K-3: Applying; K-4: Analyzing; K-5: Evaluating; K-6:Creating.

L	T	C	P
6	0	4	0

Course Description

- Unit I:** Diophantine equations: Diophantine equations – The equation $ax+by=c$ – Positive solutions – Other linear equations. (18 hours)
- Unit II:** Some special equations: The equation $x^2 + y^2 = z^2$ - The equation $x^4 + y^4 = z^2$ –The equation $4x^2 + y^2 = n$ (18 hours)
- Unit III:** Infinite continued functions: The equations $ax^2 + by^2 + cz^2 = 0$ -Infinite continued functions – Irrational numbers. (18 hours)
- Unit IV:** Quadratic Fields: Approximation to irrational numbers – Algebraic integers. (18 hours)
- Unit V:** Unique Factorization – Units in quadratic fields. (18 hours)

Text book: An introduction to the Theory of Numbers – Ivan Nivan and Herbert S. Zukerman – II edition, Wiley Eastern Ltd.
Chapter 5,6 and 9 (except 5.13, 5.14, 7.7,7.8 and 7.9)

Book for reference:
Elements of Number Theory – Kumaravelu and Suseela Kumaravelu (2002), Raja Shankar Printers, Sivakasi (V edition)

Mapping:

Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	3	3	2	2	3
CO 3	2	3	2	3	2	3	3	3	3	3
CO 4	2	3	3	3	2	3	3	3	2	3
CO 5	2	3	3	3	2	3	3	2	2	3

Strongly Correlated-3; Moderately Correlated-2; Weakly Correlated-1; No Correlation-0

Title of the Course : **CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS** (90 Hours)

Course Objective : To identify Constraints, Linear Equations and various theorems.

Course Outcomes(COs)

On successful completion of the course, the students will be able to

	Course outcome	Cognitive Level
CO 1	Demonstrate competence with the basic ideas Maxima and Minima	K-2
CO 2	Explain about Constraints and Lagrange's Multipliers Hamilton's principles-Lagrange equations	K-3
CO 3	Demonstrate Relation between differential and integral equations	K-3
CO 4	Appreciate the significance of Fredholm equations with separable kernels	K-3
CO 5	Acquired the knowledge of Iterative methods for solving equations of second kind	K-3

K-1: Remembering; K-2: Understanding; K-3: Applying; K-4: Analyzing; K-5: Evaluating; K-6:Creating.

L	T	C	P
6	0	4	0

Course Description

Unit I: Calculus of Variations and Applications Maxima and Minima – The simplest case – Illustrative examples-The variational notation-the more general case. (18 hours)

Unit II: Constraints and Lagrange's Multipliers – Variable endpoints - Sturm Liouville problems-Hamilton's principles - Lagrange equations (18 hours)

Unit III: Integral Equations – Introduction –Relation between differential and integral equations – The Green's function - Alternative definition of Green's function. (18 hours)

Unit IV: Linear Equations in cause and effect - The influence function – Fredholm equations with separable kernels – Illustrative Examples. (18 hours)

Unit V: Hilbert Schmidt theory – Iterative methods for solving equations of second kind-
Fredholm theory. (18 hours)

Text Book: Methods of Applied Mathematics, Francis B. Hildebrand, sections 2.1to 2.11,
3.1 to 3.9 and 3.11.

Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	3	3	2	2	3
CO 3	2	3	2	3	2	3	3	3	3	3
CO 4	2	3	3	3	2	3	3	3	2	3
CO 5	2	3	3	3	2	3	3	2	2	3

Strongly Correlated-3; Moderately Correlated-2; Weakly Correlated-1; No Correlation-0

Title of the Course : **PYTHON PROGRAMMING – PRACTICALS** (90 Hours)

Course Objective : To evaluate GCD of numbers, various sorts, search and to generate an adjacency matrix.

Course Outcomes(COs)

On successful completion of the course, the students will be able to

	Course outcome	Cognitive Level
CO 1	Write programs using advanced concepts of Python.	K-3
CO 2	Write, Test and Debug Python Programs.	K-4
CO 3	Implement Conditionals and Loops for Python Programs.	K-5
CO 4	Use functions and represent Compound data using Lists, Tuples and Dictionaries.	K-4
CO 5	Read, write and manipulate data from & to files in Python.	K-5

K-1: Remembering; K-2: Understanding; K-3: Applying; K-4: Analyzing; K-5: Evaluating; K-6: Creating

L	T	C	P
0	0	4	6

Course Description

LIST OF PRACTICALS IN PYTHON PROGRAMMING:

1. Find minimum/maximum in a list / guess an integer in given range
2. Distance between two points
3. Find GCD
4. Sum an array of numbers
5. Linear search
6. Binary search.
7. Find the numbers which are divisible by n in a given range
8. Print first n Fibonacci numbers
9. Selection sort
10. Insertion sort
11. Merge sort
12. Count word frequencies
13. Generate adjacency matrix of any graph on n vertices
14. Find degree of vertices from given adjacency matrix of the graph
15. Find odd number in given array/ Replace odd numbers with given integer in the given array

16. Compute multiplication of two 3x3 matrices
17. Compute mean and standard deviation of given array
18. Create a Barplot/Piechart for comparing three features.

Text Book:

1. Allen B. Dowley, "Think Python: How to Think Like a ComputerScientist", 2nd Edition.
2. Wes McKinney, "Python for Data Analysis: DataWrangling with Pandas, NumPy, and Ipython", O'Reilly, 2nd Edition, 2018.
3. Jake VanderPlas, "Python Data Science Hand Book: Essential Tools for working with Data", O'Reilly, 2017.

Reference Books:

1. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	3	3	2	3	3	3	3	3
CO 2	3	2	3	3	2	3	3	3	3	3
CO 3	3	2	3	3	3	3	3	3	3	3
CO 4	3	2	3	3	3	3	3	3	3	3
CO 5	2	2	2	3	3	3	3	3	3	3

Strongly Correlated-3; Moderately Correlated-2; Weakly Correlated-1; No Correlation-0

MANONMANIAM SUNDARANAR UNIVERSITY

M.Phil Mathematics (for Affiliated Colleges)

(From the academic year 2018 -19)

1. SCHEME OF EXAMINATION

Sl. No	Sem-ester	Paper title	Hrs/Week	Credits
1.	I	Research and Teaching Methodology	4	4
2.	I	Advanced Analysis	4	4
3	I	Project Oriented Elective Course (Theory)	4	4
4	II	Project and Viva Voce		12
		TOTAL		24

LIST OF PROJECT ORIENTED ELECTIVE PAPERS

- 1 Banach Algebra and Spectral Theory
- 2 Advanced Graph Theory
- 3 Harmonic Analysis
- 4 Theory of Near-rings
- 5 Advanced Calculus
- 6 Algebraic Graph Theory
- 7 Stochastic Modeling.
8. Wavelets

PAPER III

PROJECT ORIENTED ELECTIVE COURSE (THEORY)

1. BANACH ALGEBRA AND SPECTRAL THEORY (60 hours)

Preamble: This syllabus is designed to introduce the students to the topics of Banach algebra and Hilbert spaces. Knowledge expected is to be aware of the background concepts in algebra. The students are expected to know about functionals. This will motivate the students to learn about various operators and their characteristics.

Unit I: Banach algebras – Complex Homomorphisms – Basic properties of Spectra – Symbolic Calculus. (12 hours)

Unit II: Differentiation - Group of invertible elements – Commutative Banach algebra – Ideals and Homomorphisms – Gelfand transforms. (12 hours)

Unit III: Involutions – Applications to non commutative algebra – Positive Linear functionals. (12 hours)

Unit IV: Bounded Operators on Hilbert spaces – Bounded Operators – A commutativity theorem – Resolution of the Identity – Spectral theorem. (12 hours)

Unit V: Eigen values of normal operators – Positive operators and square roots – Group of invertible operators – Characterization of V^* algebra. (12 hours)

Text Book: Content and Treatment as in Rudin, Functional Analysis, Tata McGraw Hill, Chapters 10,11 & 12.

2. ADVANCED GRAPH THEORY (60 hours)

Preamble: This course aims to introduce the learner some topics for his research in graph theory. It provides several conjectures and open problems to widen the scope of research. The pre-requisite for the course is a sound knowledge in graph theory at the post-graduate level. The outcome of the course is identification area and problems for research in graph theory.

Unit I: Dominating sets in graphs - Bounds on the domination number: in terms of order, degree, size, degree, diameter and girth. (12 hours)

Unit II: Product graphs and Vizing's conjecture – Domatic number - Nordhaus-Gaddum type theorems - dominating functions. (12 hours)

Unit III: Decompositions and colorings of a graph – Generalizations of graph decompositions. (12 hours)

Unit IV: Necessary conditions for the existence of a G-decomposition of a graph - Cycle decompositions, Vertex labelings and graceful graphs. (12 hours)

Unit V: Perfect graphs: The perfect graph theorem – p-critical and partitionable graphs – A polyhedral characterization of perfect graphs and p-critical graphs – The strong perfect graph conjecture (and recent theorem). (12 hours)

Text Books: Content and Treatment as in

- 1) Teresa W. Haynes, Stephen T. Hedetniemi and Peter J. Slater, Fundamentals of Domination in graphs, Marcel Decker (1998), Section 1.2, 2.1to2.4 (For Unit I)
Sections 2.6, 8.3, 9.1 and 10.1 to10.3 (for Unit II)
- 2) Juraj Bosak, Decompositions of graphs , Kluwar Academic Publishers, Chapters 2, 3 4, 6 and 7. (for Units III and IV)
- 3) Martin Charles Golumbic, Algorithmic graph theory, Academic Press, Chapter 3 (for Unit V)

3. HARMONIC ANALYSIS (60 hours)

Preamble: Periodic functions play a vital role in solving many problems in Mathematics and Physics. Fourier analysis is the study of various aspects of periodicity of functions. Harmonic Analysis is a natural generalization of Fourier analysis and is significant for its mathematical aspect. The pre requisite for this course is a basic knowledge of Real and Complex analysis covered in a post graduate programme in Mathematics. The outcome of the course is to help researchers in both pure and applied mathematical fields.

Unit I: Fourier series and integrals – Definitions and easy results – The Fourier transform – Convolution – Approximate identities – Fejer’s theorem – Unicity theorem – Parseval relation – Fourier Stieltjes Coefficients – The classical kernels. (12 hours)

Unit II: Summability – Metric theorems – Pointwise summability – Positive definite sequences – Herglotz’s theorem – The inequality of Hausdorff and Young. (12 hours)

Unit III: The Fourier integral – Kernels on \mathbb{R} . The Plancherel theorem – Another convergence theorem – Poisson summation formula – Bachner’s theorem – Continuity theorem. (12 hours)

Unit IV: Characters of discrete groups and compact groups – Bochners’ theorem – Minkowski’s theorem. (12 hours)

Unit V: Hardy spaces- Invariant subspaces – Factoring F and M . Rieza theorem – Theorems of Szego and Beuoling. (12 hours)

Text Book: Content and Treatment as in Henry Helson, Harmonic Analysis, Hindustan Book Agency, Chapters 1.1 to 1.9, 2.1 to 3.5 and 4.1 to 4.3.

4. THEORY OF NEAR-RINGS

(60 hours)

Preamble: The main objective of this course is to provide the knowledge about the generalized ring structures. In fact, near-ring is a natural generalization of rings in the sense that the set of all endomorphisms of a group form a ring, where the set of all mappings of a group form a near-ring. The structure of near-rings is useful in project geometry to deal about generalized field conditions.

Unit I: The elements of theory of near-rings. **(12 hours)**

Unit II: Ideal theory. **(12 hours)**

Unit III: Elements of structure theory. **(12 hours)**

Unit IV: Near-fields. **(12 hours)**

Unit V: More classes of near-rings. **(12 hours)**

Text Book: Content and Treatment as in G. Pilz, Theory of Near-rings, North Holland, Chapters 1,2,3, 8(a), 9(a) and 9(b).

5. ADVANCED CALCULUS

(60 hours)

Preamble: The Calculus of several variables involves many branches of Mathematics such as Partial Differential Equations, Optimization, Statistics etc. The main objective of this course is to give a thorough understanding of differentiation and integration of functions of several variables. The prerequisite is a precise knowledge of Calculus of single variable. The outcome of the course is the ability to solve problems involving several variables.

Unit I : Differentiation – Basic theorems – Partial derivatives – Derivatives – Inverse functions. (12 hours)

Unit II : Implicit functions – Integration – Measure zero and Content zero – Integrable functions. (12 hours)

Unit III : Fubini's theorem – Partitions of Unity – Change of Variables. (12 hours)

Unit IV : Integration on chains - Algebraic preliminaries – Fields and Forms - Geometric preliminaries – The fundamental theorem of Calculus. (12 hours)

Unit V : Manifolds – Fields and Forms on Manifolds – Stokes' theorem on Manifolds - The Volume element – The Classical theorems. (12 hours)

Text book : Calculus on Manifolds by Michael Spivak, The Benjamin / Cummings Publishing Company. (12 hours)

References : (1) Mathematical Analysis by Tom M. Apostol, Narosa Publishing Company.
(2) Advanced Calculus by Gerald B.Folland, Pearson Publishing Company.

6. ALGEBRAIC GRAPH THEORY (60 hours)

Preamble: This course aims to improve the knowledge of the learner to apply algebra in graph theory. It is framed to give adequate exposure about algebraic approach to graph theory. The beginner of this course is expected to have sound understanding of graph theory and algebra at PG level. The outcome of the course is to enable the student to do qualitative research in algebraic graph theory.

Unit 1: Linear Algebra in graph theory: The spectrum of a graph – Regular graphs and line graphs - The homology of graphs. **(12 hours)**

Unit 2: Spanning trees and associated structures – Complexity – Determinant expansions. **(12 hours)**

Unit 3: Symmetry and regularity of graphs: General properties of graph automorphisms – Vertex-transitive graphs – Symmetric graphs – Trivalent symmetric graphs. **(12 hours)**

Unit 4: The Covering - graph construction – Distance-transitive graphs - The feasibility of intersection arrays. **(12 hours)**

Unit 5: The Laplacian of a graph: The Laplacian matrix – trees – representations – energy and eigenvalues – connectivity – the generalized Laplacian – Multiplicities – embedding. **(12 hours)**

Text Books:

1. **Norman Biggs**, Algebraic Graph Theory, Cambridge University Press, London, 1974.
Chapters 2, 3 and 4 for Unit I, 5, 6 and 7 for Unit II, C 15, 16, 17 and 18 for Unit III, 19, 20 and 21 for Unit IV.
2. **Chris Godsil, Gordon Royle**, Algebraic Graph Theory, Springer-Verlag, New York, 2006. Chapter 13 (Sections 13.1 to 13.6, 13.9 to 13.11) for Unit V.

7. STOCHASTIC MODELING

(60 hours)

Preamble: The theory of stochastic modelling is considered to be an important contribution to mathematics and it is an active topic of research. It is concerned with concepts and techniques and it is oriented towards a broad spectrum of mathematical, scientific and engineering interests. Characterization, structural properties, inferences and control of Stochastic processes are covered in every unit. The paper is designed to get deep knowledge of stochastic processes.

Recap : Basics of Probability space random variable – Discrete distributions and Continuous distributions – Expectation – Conditional Expectation – Moment Generating Function – Probability Generating Function – Laplace Transform – Joint Distributions – Functions of random variables and random vectors.

Unit I : Markov chains : Transition probability matrix of a Markov chain – First step Analysis – Functional of Random walks and successive runs – classification of states – Basic Limit Theorem of Markov Chain. (12 hours)

Unit II : Continuous time Markov Chains : Poisson distribution and Poisson process – Distributions associated with Poisson process – Pure Birth Process – Pure Death process – Birth and Death Process – Limiting behavior of Birth and Death Process – Birth and Death Process with absorbing states. (12 hours)

Unit III : Renewal Phenomena : Renewal process and Related concepts – Poisson process viewed a Renewal Process – Asymptotic behavior of Renewal process. (12 hours)

Unit IV : Branching Process and Population Growth : Branching process – branching process and generating functions – Geometrically distributed offspring – variation on Branching process – Stochastic models of Plasmid Reproduction and Plasmid copy Number partition. (12 hours)

Unit V : Queueing Systems : Queueing Processes – Poisson Arrival and exponentially distributed service times – The M/G/1 and M/G/∞ systems – variations and extensions. (12 hours)

Text Book : Content and Treatment as in Howard M. Taylor and Samuel Karlin, An Introduction to Stochastic Modeling (Revised Version), Academic Press, New York, 1984.

8. WAVELETS

(60 hours)

Preamble: Wavelet analysis has drawn much attention from both mathematicians and engineers alike. The emphasis of the course is on spline wavelets and time-frequency analysis. The only pre-requisite is a basic knowledge of function theory and real analysis. The outcome of the course is to enable the learner to apply the pure mathematics in signal processing and image analysis.

Unit I : An Overview : Fourier to Wavelets – Integral Wavelets Transform and Time frequency analysis – Inversion formulas and duals – Classification of Wavelets – Multi-resolution analysis – Spines and Wavelets.

Fourier Analysis : Fourier and Inverse Fourier Transformation – Continuous Time Convolution – The delta function – Fourier Transformation of square integrable functions. (12 hours)

Unit II : Fourier Analysis (contd): Fourier Series – Basic Convergence Theory – Poisson Summation Formula.

Wavelet Transforms and Time Frequency Analysis : The Gabor Transforms – Short time Fourier Transforms and the uncertainty principle – The integral Wavelet Transform – Dyadic Wavelets – Inversion – Frames – Wavelet Series. (12 hours)

Unit III : Cardinal Spline Analysis : Cardinal Spline spaces – B-splines and their basic properties – The time scale relation and an interpolating graphical display algorithm – B-Net representations and computation of cardinal splines - Constructions of cardinal splines – constructions of spline application formulas – Construction of Spline interpolation formulas. (12 hours)

Unit IV : Scaling functions and Wavelets : Multi-resolution analysis – Scaling functions with finite two scale relation – Direction sum Decompositions of $L^2(\mathbb{R})$ - Wavelets and their duals. (12 hours)

Unit V : Cardinal Splines Wavelets : Interpolating splines wavelets – Compactly supported spline – Wavelets – Computation of Cardinal spline Wavelets – Euler – Frebenious Polynomials. (12 hours)

Orthogonal Wavelets : Examples of orthogonal Wavelets - Identification of orthogonal two scale symbols - Construction of compactly supported orthogonal wavelets. (12 hours)

Text Book : Content and Treatment as in Charles K. Chui, An introduction to Wavelets, Academic Press, New York, 1992.

Reference Books :

1. Chui C. K. (ed), Approximation theory and Fourier Analysis, Academic Press Boston, 1991.
2. Daribeckies I, Wavelets, CBMS-NSF Series in Appl, SIAM Philadelphia, 1992.
3. Schurnaker L, L. Spline Functions : Basic Theory, Wiley, New York, 1981.
4. Nurnberger G, Applications to Spline Functions, Springer Verlag, New York, 1989.

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES
B.Sc. PHYSICS
(Choice Based Credit System)
(With effect from the academic year 2021-2022 onwards)

1. Vision of the University

To provide quality education to reach the un-reached

2. Mission of the University

- To conduct research, teaching and outreach programmes to improve conditions of human living.
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity.
- To offer a wide variety of off-campus educational and training programmes including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the work place and to serve as catalyst for economic and cultural development.
- To provide quality / inclusive education especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

3. Vision of the Department

To promote active learning, critical thinking coupled with ethical values and produce globally competent physicists.

4. Mission of the Department

The Department is committed to impart quality education both in theoretical as well as experimental physics with special emphasis on ‘learning by doing’ for socio-economic growth.

5. Preamble

The Department of Physics provides instructional programs in introductory Physics to a broad range of students through an understandable and effective method that enables them to integrate this knowledge into their normal thought processes. The department provides a forward-looking curriculum to undergraduate Physics Major, involving not only traditional physics topics but also state-of-the-art instruction in experimental techniques, computational physics and the use of computers in data acquisition and analysis, as well as active involvement in professional research.

6. Programme Outcome

Upon completion of B.Sc degree programme, the graduates will be able to

PO. 1: acquire a fundamental concepts in the field of Physics and procedural knowledge that creates different types of professionals related to the subject area of Physics, including professionals engaged in research and development, teaching and government / public service.

PO. 2: demonstrate the ability to use skills in Physics and its related areas of technologies for formulating and tackling

	Subject Part	Subject Title	Contact Hr / Week	Credit	Exam Hrs	Marks		
						Int	Ext	Total
Semester – III	Part I	Tamil / Other Languages	6	4	3	25	75	100
	Part II	English	6	4	3	25	75	100
	Part III	<u>Core subject</u> 3. Electricity & Electromagnetism	4	4	3	25	75	100
		Practical-III	2	2	3	50	50	100
		<u>Allied Subject-I</u> (for allied subjects With theory and practical) 1.Theory-Paper-I	4	3	3	25	75	100
		2.Practical-1	2	2	3	50	50	100
		<u>Skill based subject</u> (Any one) a. Maintenance of Electrical appliances b. Instrumentation Physics – I	4	4	3	25	75	100
	Part IV	<u>Non – Major Elective</u> (Any one) a. Basic Physics – I b. Applied Physics	2	2	3	25	75	100
		Common-Yoga*	2	2				
		Total	32	27				

	Subject Part	Subject Title	Contact Hr / Week	Credit	Exam Hrs	Marks		
						Int	Ext	Total
Semester – IV	Part I	Tamil / Other Languages	6	4	3	25	75	100
	Part II	English	6	4	3	25	75	100
	Part III	<u>Core subject</u> 4. Heat & Thermodynamics	4	4	3	25	75	100
		Practical-IV	2	2	3	50	50	100
		<u>Allied Subject-II</u> (for allied subjects with theory and practical) 1.Theory-Paper-II	4	3	3	25	75	100
		2.Practical-II	2	2	3	50	50	100
		<u>Skill based subject</u> (Anyone) a. Maintenance of Electronic appliances b. Instrumentation Physics – II	4	4	3	25	75	100
	Part IV	<u>Non – Major Elective - Paper - II</u> (Any One) a. Basic Physics – II b. Space Physics	2	2	3	25	75	100
		Common - Computer For Digital Era*	2	2	-	-	-	-
	Part V	Extension activity	-	1	-	-	-	-
	Total	32	28					

	Subject Part	Subject Title	Contact Hr / Week	Credit	Exam Hrs	Marks		
						Int	Ext	Total
Semester V		<u>Core subject</u> 5.Basic Electronics	6	4	3	25	75	100
		6. Spectroscopy	5	4	3	25	75	100
		7.Atomic and Nuclear Physics	6	4	3	25	75	100
	Part III	<u>Major Elective</u> (any one) a.Programming in C++ b.Communication Electronics	5	4	3	25	75	100
		Practical – V - General Practical	3	3	3	50	50	100
		Practical-VI Electronics	3	3	3	50	50	100
	Part IV	<u>Skill based subject</u> (Common) Personality development / Effective Communication / Youth Leadership	2	2	3	25	75	100
	Total	30	24					
Semester VI		<u>Core Subject</u> 9. Quantum Mechanics	5	4	3	25	75	100
		10. Digital Electronics	5	4	3	25	75	100
		11. Solid State Physics	5	4	3	25	75	100
	Subject Part	<u>Major Elective</u> (any one) a.Energy Physics b.Medical Physics	5	4	3	25	75	100
		Project	4	4	3	50	50	100
		Practical-VII General Practical	3	3	3	50	50	100
		Practical-VIII Electronics	3	3	3	50	50	100
	Total	30	26					

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-III/

NON MAJOR ELECTIVE

PAPER 1.a / BASIC PHYSICS-I

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Recall the definition of speed, velocity and acceleration	1	Re
CO-2	Apply the principle of work, power and energy in any one daily activity.	3	Ap
CO-3	List out the applications of Bernouille's theorem	3	Ap
CO-4	Analyse the functioning of aventurimeter and Pitot's tube	7	An
CO-5	Summarize the effect of reverberation in buildings	1	Un
CO-6	Create a method to produce and detect plane polarized light	7	Cr
CO-7	Enumerate the different types of resistances	1	Un
CO-8	Construct Wheatstone's bridge using Kirchoff's law	7	Cr

**MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-III/
NON MAJOR ELECTIVE
PAPER 1.a BASIC PHYSICS-1**

Preamble: Objective of the paper is to provide a basic knowledge in Physics for students who do not study physics as major/allied subject

UNIT I: MECHANICS

Motion-speed, velocity, acceleration- force –equations of motion- Newton's laws - momentum - work, power and energy -conservation of energy and momentum.

UNIT II: PROPERTIES OF MATTER

Three states of matter - binding forces - fluid pressure and thrust - applications - Pascal law - Archimedes principle – surface tension-capillary action - Bernoulli's principle – Viscosity – venturi meter - pitot's tube.

UNIT III: HEAT AND SOUND

Measurement of heat and temperature - clinical thermometer - heat transfer - thermos flask - change of state - effect of pressure on boiling point and melting point - heat engines - steam engine and diesel engine-sound and music - reverberation - acoustics of building - recording and reproduction of sound in film.

UNIT IV: OPTICS

Reflection and refraction-concave and convex mirrors and lenses-dispersion- spectra-rainbow- interference-diffraction-polarization-concepts with examples- uses-double refraction-optical activity-quartz crystal

UNIT V: ELECTRICITY

Electric field - potential - Ohm's law - electrical energy and power - resistance - types of resistance - fixed resistance - variable resistance.- resistance in series and parallel -Kirchoff's laws

Books for study and Reference

1. Properties of matter by Murugesan R, S Chand & Co. Pvt. Ltd., New Delhi
2. Text book of sound by Brij Lal & Subramaniam, Vikas Publishing House, New Delhi,1982
3. Electricity and Magnetism - R. Murugesan. (S. Chand & Co.)
4. Heat and thermodynamics - Brijlal and Subramaniyam, S Chand & Co.
5. Optics by Subramaniam N & Brij Lal, S Chand & Co. Pvt. Ltd., New Delhi,1990

**MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-III/
NON MAJOR ELECTIVE
PAPER 1.b /APPLIED PHYSICS**

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Explain about the conventional energy Sources	1,7	Re,Un
CO-2	Illustrate about the world's reserve of conventional energy. To classify various forms of energy.	1	Un,An
CO-3	Summarize about fossil fuels such as coal, oil and natural gas and their availability, statistical details.	1	Re,Ev
CO-4	Explain about fossil fuel's application and to list out the merits and demerits.	1,6	An
CO-5	Illustrate about Bio mass energy and Biomass classification and to elaborate the Bio Mass Conversion process	1,5	Re,An
CO-6	Summarize about Dheena Bandhu Model gas plant. They can explain the importance of wood gasification, Also to list out the merits and demerits of Bio Mass	1,5	Un,Ev
CO-7	Demonstrate about the renewable energy resources Such as solar energy and their applications	1,6	Re
CO-8	Elaborate about solar pond, solar water heater, solar cookers, solar green house and solar cell	1,3	Un,An
CO-9	Illustrate about Geothermal energy and Geo thermal power plant. Summarize about the wind energy, wind farms and wind mill.	1,3	Re,Un
CO-10	Explain the process of producing energy from tides and energy from waves	1,3	Re

**MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-III/
NON MAJOR ELECTIVE**

**PAPER 1.b.
APPLIED PHYSICS**

Preamble: This paper enables the students to understand variable energy sources and the need for finding alternate energy source.

UNIT-I: Conventional energy sources

Conventional energy sources –world’s reserve of conventional energy sources–various forms of energy-renewable and conventional energy systems- comparison

UNIT-II: Fossil fuels

Fossil fuels – coal, oil and natural gas-availability-statistical details- applications-merits and demerits

UNIT-III: Biomass energy: Biomass energy-biomass classification-biomass conversion process-biogas plants-Deena bandhu model gas plant-wood gasification-advantages and disadvantages of biomass

UNIT-IV: Renewable energy sources

Renewable energy sources-solar energy - importance - storage of solar energy - applications of solar energy -solar pond - solar water heater-solar crop dryers-solar cookers- solar green house - solar cell

UNIT-V: Geothermal energy

Geothermal energy-Geothermal power plant-wind energy and wind farms- wind mills - types – ocean thermal energy conversion - energy from tides-energy from waves

Books for study and Reference

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand & Co. Ltd.
3. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd., New Delhi.

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-IV/

NON MAJOR ELECTIVE

PAPER 2.a / BASIC PHYSICS-II

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Recall the structure of nuclei	1	Re
CO-2	Explain the properties of alpha, beta and gamma rays	1	Un
CO-3	Enumerate the applications of para, dia and diamagnetic materials	7	Ap
CO-4	Analyse the role of superconductors in the present technology	3	An
CO-5	Weigh the use of Laser technology in medicinal field	7	Ev
CO-6	Explain the postulates of special theory of relativity	7	Cr
CO-7	Differentiate between analog and digital circuits	3	An
CO-8	Design a logic circuit for the addition of two binary numbers	7	Cr

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-IV/

NON MAJOR ELECTIVE

PAPER 2.a

BASIC PHYSICS-II

Preamble: Objective of the paper is to gain knowledge on Basic principles of Physics

UNIT I: NUCLEAR PHYSICS

Introduction - nuclear structure - properties of nucleus - packing fraction - binding energy - nuclear forces - Radio activity - properties of alpha, beta and gamma rays - radio carbon dating - nuclear fission - nuclear fusion

UNIT II: MAGNETIC MATERIALS

Classification of magnetic materials - para-dia and ferromagnetic materials - properties – applications - crystalline and amorphous materials – conductors – insulators – superconductors - properties – applications

UNIT III: LASERS

Introduction – absorption – spontaneous emission – stimulated emission - population inversion - general laser system – He - Ne laser - CO₂ laser - applications.

UNIT IV: RELATIVITY

Introduction - reference frames - postulates of the special theory of relativity - length contraction - time dilation (no derivation) - Quantum mechanics - dual nature of wave and radiation – de - Broglie waves

UNIT V: NUMBER SYSTEMS

Number systems in digital electronics-binary, decimal and hexadecimal numbers – inter conversions - binary addition and subtraction — binary coded decimal - logic gates

Books for study and Reference

1. Modern Physics - R.Murugesan, S. Chand & Co
2. Electricity and Magnetism - R. Murugesan (S. Chand & Co.)
3. Digital principles and applications - Albert Paul Malvino & Donald P.Leach
4. Mechanics and mathematical physics- R.Murugesan - S Chand & Co. Pvt. Ltd., New Delhi

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-IV/

NON MAJOR ELECTIVE

PAPER 2.b / SPACE PHYSICS

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Explain about universe planets. Also to imagine and classify interior and exterior planets	1	Re,Un,Ev
CO-2	Illustrate about Van Allen Belts and to summarize about auroro	1	Re,Un,Ev
CO-3	Classify and illustrate about comets, Meteors, Asteroids	1,5	Re,An
CO-4	Elaborate the salient features of asteroids, meteors and its uses.	1,5	Re,An
CO-5	Describe about sun. To list out the structure of photosphere, chromosphere, Corona.	1	Un
CO-6	Elaborate the satellites of planets their structure. Interpret the phases and features of moon	1	Un,Ev
CO-7	Explain about star constellation. Also to discuss about binary stars and their origin.	1	Un
CO-8	Classify the types of clusters, types of variable, types of galaxies.	1	Un,An
CO-9	Summarize the origin of universe.	1	Un,An
CO-10	Illustrate about the Big Bang Theory, Pulsating Theory, Steady state theory.	1	Re,Un

**MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-IV/
NON MAJOR ELECTIVE**

**PAPER 2.b
SPACE PHYSICS**

Preamble: This course provides an understanding of celestial objects.

UNIT I : Universe

Planets - interior planets - exterior planets - crust, mantle and core of the earth - different region of earth's atmosphere - rotation of the earth - magnetosphere - Van Allen belts - Aurora.

UNIT II: Comets, Meteors, Asteroids

Composition and structure of comets - periodic comets - salient features of asteroids, meteors and its use.

UNIT III: Sun

Structure of photosphere, chromosphere, corona - sunspots - solar flares - solar prominence - solar plages - satellites of planets - structure, phases and their features of moon.

UNIT IV: Stars

Constellations - binary stars - their origin and types star clusters – Globular clusters - types of variable stars - types of galaxies.

UNIT V: Origin of Universe

Big bang theory - pulsating theory - steady state theory - composition of universe expansion

Books for study and Reference

1. K.D. Abyankar, Astrophysics of the solar system, University press, India.
2. Baidyanath Basu, An introduction to Astrophysics, Prentice Hall of India, New Delhi.
3. Prof. P. Devadas, The fascinating Astronomy, Published by Devadas Telescopies, 2, Charkrapani Road, Guindy, Chennai.
4. Elements of Space Physics – R.P. Singhal, PHI.

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-V

MAJOR ELECTIVE

(any one)

a. PROGRAMMING IN C++

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	Understand the basics of C++ programming.	1	U
CO - 2	Understand the applications of C++ modules.	1, 2	U, Ap
CO - 3	Understand the basic techniques of numerical analysis.	1, 2, 7	U, C
CO - 4	Understand and apply computational techniques to physical problems.	1, 7	U, Ap
CO - 5	Understand the procedural and object-oriented paradigms with concepts like streams, classes, functions, and arrays.	1, 2, 8	U
CO - 6	Understand dynamic memory management techniques using member functions, classes, constructors, etc.	1, 8	U, C
CO - 7	Understand the concept of function overloading and operator overloading.	1	U, C
CO - 8	Understand inheritance and its types of inheritance.	1, 8	U, C
CO - 9	Managing the C++ streams with operations and classes	1, 2	U, Ap
CO - 10	Understand the fundamental C++ file operations for single and multiple files.	1, 2	U, Ap

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-V

MAJOR ELECTIVE

(any one)

b. PROGRAMMING IN C++

Preamble: Objective of the course is to provide knowledge about the basics of Computer programming in C++ by writing programs. The paper does not need any special prerequisite and the learners are expected to come out with the ability to apply the computer language C++ to solve problems.

UNIT-I: WHAT IS C++

Introduction –comments –output operator-input operator-io stream file –tokens - keywords -identifiers and constants - declaration of variables - basic data types - operators in C++ -expressions and their type-hierarchy of arithmetic - control structures- a simple C ++ program (arithmetic operations using do while loop)

UNIT-II: ARRAYS AND FUNCTIONS IN C++

Introduction - one dimensional and two dimensional arrays - initialization of arrays – a simple matrix addition program. Functions - introduction - function prototyping - inline functions - function overloading –program to find the factorial of a number using function

UNIT-III: CLASSES AND OBJECTS

Introduction – specifying a class – defining member functions – creating objects - C ++ program with class - nesting of member functions - objects as function arguments - arrays within a class - friend functions-constructors –default constructors- parameterized constructors- copy constructor - multiple constructors

UNIT-IV: OPERATOR OVER LOADING AND INHERITANCE

Introduction – defining operator overloading-over loading unary operators –binary operators – rules for overloading operators-Inheritance - single inheritance - multiple inheritance –multi level inheritance-hybrid inheritance

UNIT-V: MANAGING CONSOLE I / O OPERATIONS

Introduction - C ++ stream - C ++ stream classes - formatted console I/O operations (width, precision, fill) - working with files - classes for file steam operations - opening and closing a file – detecting end of file - opening files using constructors and open –working with single and multiple files

Books for study

1. Object oriented Programming with C++ - E.Balagurusamy, Tata Mc Graw-Hill publishing company Ltd. New Delhi
2. Programming with C++ - D. Ravichandran, Tata Mc Graw-Hill publishing company Ltd. New Delhi

Books for reference

1. Object oriented Programming in C++- 4th Edn.Robert Lafore-Macmilan publishing company Ltd.
2. Fundamentals of Programming with C++ -Richard I. Halterman

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-V

MAJOR ELECTIVE – b. COMMUNICATION ELECTRONICS

Course outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	Analyse amplitude modulation and AM envelope. To explain AM frequency bandwidth and phasor representation of AM with carrier. To determine the coefficient of modulation or percentage modulation or modulation index.	1,4	Un, An
CO - 2	illustrate AM power distribution and AM current relation and efficiency. Elaborate emitter modulations or low power AM collector modulator. Classify low level transmitter and high level transmitter	1	An
CO - 3	Analyze the comparison of AM system and Quadrature amplitude modulation. To illustrate the Principles of AM detection and AM receivers	1,5	Re,An
CO - 4	Explain about tuned radio frequency receiver or straight receiver. To elaborate double frequency conversion AM receiver.	1	Re,Ev
CO - 5	Illustrate Frequency modulation and phase modulation. To determine phase modulation and modulation index.	4,5	Re,Un
CO - 6	Elaborate the conversion of FM to PM and they can picturize the phasor representation of FM and PM. To compare AM and FM	1	Ev
CO - 7	Explain and Analyze FM detectors and balanced slope detector	4	An
CO - 8	Illustrate the ratio detector and to elaborate the important features of FM super heterodyne receiver and FM noise suppression. Also to summarize about threshold extension by FMFB technique	5	An,Un
CO - 9	Elaborate about BFSK and to summarize about Binary phase shifting Key. The importance of Quadrature PSK and Differential PSK.	1,5	An,Un
CO - 10	Comparison of digital modulations can be done. to compare and classify correlative coding and Duo binary encoding.	1,4	Un,Ap

MAJOR ELECTIVE – b. COMMUNICATION ELECTRONICS

Preamble: This course enables the students to understand various modulation and demodulation techniques used for communication. The paper needs a basic knowledge in electronics and mathematics and the learners are expected to come out with the ability to choose proper modulation techniques.

UNIT-I: AMPLITUDE MODULATION AND TRANSMISSION

Introduction–amplitude Modulation–AM envelop–AM frequency spectrum and bandwidth–Phas or representation of AM with carrier – coefficient to f modulation or percentage modulation or modulation index – degrees of modulation – AM power distribution – AM Current relation and efficiency–modulation by complex information signal –double side band suppressed carrier AM - single side band suppressed carrier AM – Vestigial side band amplitude modulation – AM modulator circuits – emitter modulations or low power AM –collector modulator or medium and high power AM modulator - AM transmitters –Broadcast AM transmitters–Low level of AM transmitter–High level AM transmitter.

UNIT-II: AMPLITUDE MODULATION - RECEPTION

Comparison of AM system – Quadrature amplitude modulation – principles of AM detection – AM receivers – receiver parameters – Tuned radio frequency (TRF) receiver or straight receiver – principles of super hetrodyne – double frequency conversion AM receiver.

UNIT-III: ANGLE MODULATION – TRANSMISSION

Introduction – Frequency modulation – Phase modulation – Phase deviation and modulation index – Multi tone modulation – Transmission band width of FM –conversion of PM to FM or frequency modulator– conversion of FM to PM / phase modulators – commercial broadcast FM – phase or representation of an FM and PM – average power of an AM/FM wave – generation of FM – direct method of FM generation – reactance tube modulator– indirect method of FM wave generation – FM transmitters – indirect method – Comparison of AM and FM.

UNIT-IV: FM RECEPTION

FM detectors – Balanced slope detector – Foster seemly discriminator – ratio detector –FM super heterodyne receiver–FM noise suppression–threshold extension by FMFB technique.

UNIT-V: DIGITAL MODULATION TECHNIQUES

Introduction–BFSK–Binary phase shift keying – Quadrature PSK –Differential PSK – Performance comparison of digital modulation schemes - M ary FSK– correlative coding– Duo binary encoding.

Book For Study

1. Principles Of Communication Engineering - Dr. K.S.Srinivasan, Second Edition:2010.
2. Electronic communication systems – George Kennedy & Bernard Davis, Tata Mcgraw Hills, 4th edition, 2008

Books for reference:

1. Electronic communication systems – Blake, Joseph J Adams ki, Sun Yifeng, Delamer publication, 2nd edition, 2012 (Rupa Publication, India)
2. Fundamentals of Electrical engineering – Wayne tomasi

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-VI

Major Elective: a. Energy Physics

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	Understand the importance of conventional and non-conventional energy resources.	1, 6	U
CO - 2	Understand the applications, merits, and demerits of conventional and non-conventional energy resources.	1	U, Ap
CO - 3	Understand the basic aspects of solar energy.	1, 6	U, C
CO - 4	Understand solar energy appliances with their merits and demerits.	1	U
CO - 5	Understand the basic aspects of the photovoltaic principle.	1, 6	U, Kc
CO - 6	Learn about photovoltaic appliances and how they work.	1	C, Ap
CO - 7	Understand the solar cell with its applications and its types.	1, 6	U, Kc
CO - 8	Understand the basic ideas of biomass energy and recognise their merits and demerits.	1, 6	U, An
CO - 9	Understand the methods and classifications of biomass energy.	1	U
CO - 10	Understand the basic principles of wind energy conversion.	1, 6	U
CO - 11	Understand the fundamental concepts of oceans and chemical energy resources, as well as their benefits and drawbacks.	1, 6	U, Ap

MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester–VI

MAJOR ELECTIVE

(any one)

a. ENERGY PHYSICS

Preamble: Objective of the course is to provide an understanding of the present energy crisis and various available energy sources. The paper does not need require any special prerequisite and the learners are expected to know the use of alternate energy sources

UNIT I: INTRODUCTION TO ENERGY SOURCES

World's reserve of Commercial energy sources and their availability-Variou forms of energy-renewable & non-renewable energy sources – Conventional & non-conventional energy sources–commercial & non-commercial energy sources, comparison –merits, demerits and applications of coal, oil and natural gas

UNIT II: SOLAR ENERGY

Solar energy – nature of solar radiation and its components -Basic Principles of Liquid flat plate collector –Materials for flat plate collector -Construction and working- Solar water heater - Solar crop dryer – Solar space cooling – solar ponds - solar cookers (box type) - merits and demerits of solar energy

UNIT III: PHOTOVOLTAIC SYSTEMS

Introduction – Photovoltaic principle - Basic Silicon Solar cell- Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells-Application of solar photovoltaic systems - PV Powered fan – PV powered area lighting system– A Hybrid System.

UNIT IV: BIOMASS ENERGY

Introduction-Biomass classification- Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion -Working of biogas plant- floating and fixed dome type plant -advantages and disadvantage of -Bio-gas from plant wastes-Methods for obtaining energy from biomass-Thermal gasification of biomass-Working of down draft gasifier- Advantages and disadvantages of biological

conversion of solar energy.

UNIT V: WIND ENERGY AND OTHER ENERGY SOURCES

Wind Energy Conversion-Classification and description of wind machines, wind energy collectors- Energy storage-- Energy from Oceans and Chemical energy resources - Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation-Energy and power from waves- wave energy conversion devices- Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles.

Books for study

1. Rai G. D, Non conventional Energy sources, 4th Edition, Khanna Publishers,2010
- 2.Solar Energy- Principles of thermal collection and storage - S.P.SUKHAME-Tata-McGraw-Hill Publishing Company Ltd.

Books for References

1. Chetan Singh Solanki, Solar Photovoltaics Fundamentals, Technologies and Applications, 2nd Edition, PHIL earning Private Limited, 2011.
2. Kothari D.P., K.C.Singal and Rakesh Ranjan, Renewable energy sources and emerging Technologies, Prentice Hall of India, 2008.
3. Jeffrey M. Gordon, Solar Energy: The State of the Art, Earthscan, 2013.
4. Kalogirou S.A., Solar Energy Engineering: Processes and Systems, 2nd Edition, Academic Press, 2013.
5. Zobia A.F. and Ramesh Bansal, Hand book of Renewable Energy Technology, World Scientific, 2011

MSU/2021-22/UG-Colleges/Part-III
(B.Sc. Physics)/Semester-VI
Major Elective : b. MEDICAL PHYSICS

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Define electromagnetic spectrum Sketch the X- ray tube design	1,2	Re, Ap
CO-2	Categorize half wave & full wave rectification	2	An
CO-3	Identify the sources of radio activity. Explain the units of radiation	1,3	Re, Un
CO-4	Measure the biological damage	4	Ev
CO-5	Discuss about CAT scanners, Identify transducers for biomedical applications	1	Ev, Un
CO-6	Estimate the computer analysis of ECG	5	Cr
CO-7	State radiography, Compare Ultrasound imaging & magnetic resonance imaging	1,3	Re,An
CO-8	Determine the uses of Gamma Camera	5	An
CO-9	Generalize the uses of lasers. Interpret the effect of laser radiation on tissues	5,8	Ap

CO-10	Justify laser as a beauticians tools	8	Ev
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MSU/2021-22/UG-Colleges/Part-III(B.Sc.Physics)/Semester-VI

MAJOR ELECTIVE

b. MEDICAL PHYSICS

Preamble: This course facilitates an understanding of the basic concepts in Biomedical instrumentation and awareness regarding radiation hazards and safety.

UNIT-I: X-RAYS

Electromagnetic spectrum - production of x-rays - x-ray spectra –Brehms strahlung process
 - Characteristic x-ray - X-ray tubes - Coolidge tube - X-ray tube design - tube cooling - stationary mode - Rotating anode X-ray tubes -Tube rating - quality and intensity of X-ray. X-ray generator circuits - half wave and full wave rectification - filament circuit - kilo voltage circuit - high frequency generator- exposure timers- HT cables.

UNIT-II: RADIATION SAFETY AND HEALTH PHYSICS

Introduction to Radio activity - Artificial and natural - radioactivity –Physical features of radiation-units of radiation- conventional sources of radiation, Interaction of different types of radiation with matter -penetration power in living cells-radiation damage to the cell-effect of radiation on cells-measurement of ionizing radiation- measurement of biological damage-Linear energy transfer (LET)-radiation risk-radiation dosimetry-security of radio-active material- radio-active waste management

UNIT-III: BIOMEDICAL INSTRUMENTATION

Development of biomedical instrumentation-biometrics-introduction to the man-instrument system-components of man-instrument system-transducers for biomedical applications-biomedical computer applications-computer analysis of ECG-computerized axial tomography (CAT) Scanners

UNIT-IV: MEDICAL IMAGING PHYSICS

Radiological imaging - Radiography - Filters - grids - cassette - X-ray film –film processing – fluoroscopy - computed tomography scanner- principle function - display - generations –

mammography - ultrasound imaging - magnetic resonance imaging - thyroid uptake system - Gamma camera (Only Principle, function and display)

UNIT-V LASERS IN MEDICINE

Introduction to laser-principle and production of laser- effects of laser radiation on tissues - photo thermal effects- photo chemical effects –photo dynamic therapy-Laser applications in therapy and diagnosis-ophthalmology - Fibre optic endoscopy and dentistry-Laser as a beautician's tool-laser hazards-biological effects.

Books for study and Reference

1. Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
2. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
3. Biomedical instrumentation-Leslie Cromwell, Fred J. Weibel-Erich A. Pfeiffer-Pearson Publications
4. Lasers in Medicine- RW Waynant, Plenum Publishing Co
5. Nuclear medicine physics: Chandra – Lippincot Williams and Wilkins (1998)

PROGRAMME STRUCTURE

Semester	Course. No.	Course. Status	Course. Title	Contact Hrs./Week	Credits
I	1	Core- 1	Classical Mechanics	6	4
	2	Core- 2	Mathematical Physics - I	6	4
	3	Core- 3	Integrated Electronics	5	4
	4	Core- 4	Nonlinear Dynamics	5	4
	5	Core- 5 Practical1	General Physics Experiments -I	4	3
	6	Core- 6 Practical2	Electronics Experiments -I	4	3
			Subtotal	30	22
II	7	Core- 7	Mathematical Physics - II	5	4
	8	Core- 8	Electromagnetic Theory	5	4
	9	Core- 9	Microprocessor 8085 & Microcontroller 8051	5	4
	10	Core- 10	Statistical Mechanics	4	4
	11	FW/ST	Field Work/ Study Tour	3+2**	3
	12	Core-11 Practical3	General Physics Experiments-II	4	2
	13	Core-12 Practical4	Electronics Experiments -II	4	2
			Subtotal	30	23
III	14	Core- 13	Quantum Mechanics- I	6	4
	15	Core- 14	Atomic and Molecular Spectroscopy	6	4
	16	Core- 15	Condensed Matter Physics	5	4
	17	Core- 16	Numerical Methods & Programming in C++	5	4
	18	Core- 17 Practical5	Advanced Physics Experiments -I	4	2
	19	Core- 18 Practical6	Microprocessor Experiments	4	2
			Subtotal	30	20
IV	20	Core- 19	Quantum Mechanics- II	5	4
	21	Core- 20	Nuclear and Particle Physics	5	4
	22	Core- 21	Research Methodology	4*	4
	23	Core- 22 Practical7	Advanced Physics Experiments-II	4	2
	24	Core- 23 Practical8	C++Programming	4	2
	25	Elective-I	Elective I(a) Optoelectronics(OR) Elective I(b) Materials Science(OR) Elective I(c) Nano Physics(OR) Elective I(d) Renewable Energy Sources.	3	3
			Subtotal	30	27

5. Matrix Multiplication

- Multiplication of given matrices
- Rotation matrix definition.
- C++ program to rotate the given point about the origin using rotation matrix by the given angle.

6. Numerical Differentiation

- Numerical differentiation - related to any physical problem
- Derivation of Newton's law of cooling -equation
- C++ program to verify the Newton's law of cooling from the given experimental data.

7. Solution of Algebraic and Transcendental equations.

- Solution of the given equations using Newton Raphson Method - manual calculation.
- C++ program to find the solution using N-R method and verification.

Mapping of Course outcomes with Programme Outcomes and Programme Specific Outcomes:

CO/ PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO
CO1	1	2	2	1	2	2	1	1	2	3	2	2	2	2
CO2	2	3	3	2	3	2	1	2	2	3	2	2	2	2
CO3	2	3	3	2	3	2	1	2	2	3	2	2	3	2
CO4	2	2	3	2	3	2	1	2	2	3	2	3	2	2

Strongly Correlated - 3; Moderately Correlated - 2;

Weakly Correlated - 1; No Correlation - 0;

MSU / 2021-22 / PG –Colleges / M.Sc Physics/ Semester IV / Ppr.no.25 / Elective – 1 (a)Title of the Course : **OPTOELECTRONICS****Course Outcomes**

At the end of the course, the student will be able to:

Course Outcomes		Cognitive level
CO1	Understand fundamental properties of light and wave-propagation thereby applying it to analyze the resonant cavities at plane boundaries	K-2, K-3, K-4
CO2	Infer the operation principles of different types of integrated waveguides and examine the integrated optical network	K-3, K-4, K-5
CO3	Associate the concept of optical fibre, its construction and importance in communication physics	K-3, K-4, K-5
CO4	Analyze different laser systems and its characteristics, design architectures	K-3, K-4, K-5
CO5	Interpret the process of image formation and reproduction in hologram; Also able to examine different types of holograms	K-2, K-3, K-4

Cognitive level	Content
K-1	Remember
K-2	Understand
K-3	Apply
K-4	Analyze
K-5	Evaluate
K-6	Create

Course Description

Preamble: The student should gain knowledge on an optical communication system. The course permits students to measure different kinds of losses in an optical fiber. The student will be able to measure parameters related to LEDs as optical sources and coupling. The performance of different optical detectors can be evaluated by the student. The student will be able to obtain gainful employment in the telecommunication industry.

L	T	C	P
3	0	3	0

UNIT I: OPTICAL FIBERS AND OPTICAL COMMUNICATION SYSTEMS

Evolution of fiber optic systems - optic fiber transmission link - nature of light - basic laws of light - optic fiber modes and configurations: fiber types, ray optics representation, modes in step index fibers - linearly polarized modes - single mode fibers - graded index fiber - Fiber materials - Fiber fabrication - fiber optic cables.

UNIT II: SIGNAL DEGRADATION IN OPTICAL FIBERS

Attenuation: Attenuation Units - Absorption losses - Scattering Losses - Bending Losses - Core and cladding Losses - signal Distortion in Optical Waveguides: Information capacity Determination, Group Delay, Material Dispersion, Waveguide Dispersion - Signal Distortion in Single Mode Fibers.

UNIT III: OPTICAL SOURCES

Topics from Semiconductor Physics: Energy Bands, Intrinsic and Extrinsic Material, the pn junctions Direct and Indirect Band Gaps, Semiconductor Device Fabrication - Light-Emitting diodes (LED's): LED Structures, Light Source Materials - Quantum Efficiency and LED Power - Modulation of an LED - Laser Diodes: Laser diode Modes and Threshold conditions - Laser

diode.

UNIT IV: POWER LAUNCHING AND COUPLING

Source - to - Fiber Power launching: Source Output Pattern, Power - Coupling Calculation - Power Launching versus Wavelength - Equilibrium Numerical Aperture - Lensing Schemes for coupling Improvement: Non-imaging Microsphere.

UNIT V: PHOTO DETECTORS

Physical Principles of Photodiodes - The pin Photo detector- Avalanche Photodiodes - Photodetector Noise: Noise Sources, Signal-to-noise Ratio - Detector Response Time.

Book for Study:

1. Gerd Keiser, Optical Fiber Communication, Third Edition, Mc Graw Hill International (2000), relevant sections of chapter 1 to 6.

Book for Reference:

1. Jasprit Singh, Optoelectronics: An introduction to materials and devices, Mc Graw Hill, Singapore (1996).

Related online resources:

1. <https://youtu.be/p6uMrpX8G7s>
2. <https://youtu.be/VfKpqFKOccE>
3. <https://youtu.be/4JKjqveWGlw>

Mapping of Course outcomes with Programme Outcomes and Programme Specific Outcomes:

CO/ PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO
CO1	3	3	3	1	3	3	2	3	3	3	1	3	3	3
CO2	3	3	3	1	3	3	2	3	3	3	1	3	3	3
CO3	3	3	3	1	3	3	2	3	3	3	1	3	3	3
CO4	3	3	3	1	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	1	3	3	1	3	3	3	2	3	3	2

Strongly Correlated - 3; Moderately Correlated - 2;

Weakly Correlated - 1; No Correlation - 0;

MSU / 2021-22 / PG –Colleges / M.Sc Physics/ Semester IV / Ppr.no.25 / Elective – 1 (b)

Title of the Course : **MATERIALS SCIENCE**

Course Outcomes

At the end of the course, the student will be able to:

Course Outcomes		Cognitive level
CO1	Understand the applications of phase diagram and the overall transformation kinetics	K-2,K-3, K-5
CO2	Gains knowledge about the elastic, anelastic and viscoelastic behavior	K-2,K-4
CO3	Realize the nature of crystalline solids and also acquires knowledge about the classification of polymers	K-3,K-4, K-5
CO4	Know the concept of various imperfections exists within the crystal lattice	K-3,K-4
CO5	Acquires a good knowledge about the mechanisms of oxidation and corrosion and also the protection methods against fracture	K-3,K-4, K-5

Cognitive level	Content
K-1	Remember
K-2	Understand
K-3	Apply
K-4	Analyze
K-5	Evaluate
K-6	Create

Course Description

Preamble: The course details about the temperature effect, elastic behavior of materials, solid structure, imperfections in the crystal, the various deformation of materials.

L	T	C	P
3	0	3	0

Unit I: Phase diagram

Phase rule - Single component systems - Binary Phase diagrams - Micro structural changes during cooling - The lever rule - Some typical phase diagrams - other applications of phase diagrams Phase transformations - Time scale for phase changes - Nucleation and growth - The growth and the overall Transformation kinetics - applications.

Unit II: Elastic behaviour

Atomic model for elastic behavior - The Modulus as a parameter in Design - Rubber like elasticity - An elastic behavior - Relaxation behaviours - Viscoelastic behavior - Spring - Dashpot models.

Unit III: Structure of solids

The crystalline and non-crystalline states - Covalent solids - Metals and alloys - Ionic Solids The structure of silica and silicate – polymers - classification of polymers - Structure of long chain polymers - Crystallinity of long chain polymers.

Unit IV: Imperfections

Crystal imperfections - Point imperfections - The geometry of dislocations - other properties of dislocations - Surface imperfections.

Unit V: Oxidation, corrosion and other deformation of materials

Mechanisms of Oxidation-Oxidation resistant materials-the principles of corrosion protection against corrosion - Plastic deformation - The tensile stress-strain curve - Plastic deformation by slip-Creep-Mechanisms of creep-Creep resistant materials - Ductile fracture - brittle fracture - methods of protection against fracture.

Book for Study:

1. Materials Science and Engineering - A First Course, V. Raghavan, Fifth Edition, Prentice Hall of India, New Delhi, 2011.

Online Reference:

1. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Book%3A_Physical_Chemistry_\(Fleming\)/08%3A_Phase_Equilibrium/8.02%3A_Single_Component_Phase_Diagrams](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Book%3A_Physical_Chemistry_(Fleming)/08%3A_Phase_Equilibrium/8.02%3A_Single_Component_Phase_Diagrams)
2. <https://www.youtube.com/watch?v=symExnyQ49M>
3. <https://www.youtube.com/watch?v=lxNYAxr5IPc>
4. https://www.researchgate.net/publication/322892419_Experimental_study_of_concrete_beams_prestressed_with_basalt_fiber_reinforced_polymers_Part_II_Stress_relaxation_phenomenon/figures?lo=1&utm_source=google&utm_medium=organic
5. <https://www.sciencedirect.com/topics/engineering/surface-imperfection>
6. <https://www.fastradius.com/resources/top-5-corrosion-resistant-materials/>
7. <https://yenaengineering.nl/brittle-and-ductile-fracture/>

Mapping of Course outcomes with Programme Outcomes and Programme Specific Outcomes:

CO/ PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO
CO1	3	3	2	1	3	2	1	3	3	2	1	2	3	2
CO2	3	2	3	1	3	2	1	3	3	2	1	2	2	3
CO3	3	3	3	1	3	2	1	3	3	2	1	2	3	2
CO4	3	3	3	1	3	3	1	3	3	2	1	2	3	3
CO5	3	3	3	1	3	2	1	3	3	3	1	2	3	2

Strongly Correlated - 3; Moderately Correlated - 2;

Weakly Correlated - 1; No Correlation - 0;

MSU / 2021-22 / PG –Colleges / M.Sc Physics/ Semester IV / Ppr.no.25 / Elective – 1 (c)Title of the Course : **NANOPHYSICS****Course Outcomes**

At the end of the course, the student will be able to:

Course Outcomes		Cognitive level
CO1	Understand various chemical and physical methods for the synthesis of diverse types of nano materials (0D, 1D and 2D)	K-2, K-4
CO2	Quantify Mechanical properties of solids in terms of stress and strain and their relationship to each other and analyze synthesis methods for various nano composite materials	K-2, K-4
CO3	Understand different Nano material Characterization and apply it to study the characterization	K-2, K-3
CO4	Able to categorize functional materials in terms of structural, mechanical, thermal, optical and electrical properties	K-2, K-4
CO5	Gain knowledge about the various applications of Nano structured materials in biotechnology, electronics, defense and photonics	K-2, K-3

Cognitive level	Content
K-1	Remember
K-2	Understand
K-3	Apply
K-4	Analyze
K-5	Evaluate
K-6	Create

Course Description

Preamble: The course permits students to study the synthesis, characterization, properties and application of nanomaterials.

L	T	C	P
3	0	3	0

UNIT I

Synthesis of Nanostructured Materials: Idea of band structure extended to nanostructured materials-0D nanostructures (quantum dots) - 1D nanostructures (quantum wires) - 2D nanostructures (quantum wells) - Carbon Nanomaterials: Fullerenes – CNT - Graphene

UNIT II

Introduction to Nanocomposites: composite material - Mechanical properties of nano composites - stress-strain relationship - toughness - strength - plasticity - synthesis methods for various nano composite materials: sputtering - mechanical alloying - sol-gel synthesis - thermal spray synthesis

UNIT III

Nanomaterial Characterization: Principle & Applications: X-ray diffraction - Debye-Scherer Formula - FTIR - Raman Spectroscopy - SEM - TEM - Differential Scanning Calorimetry (DSC)

UNIT IV

Properties of Nanostructured materials: Mechanical properties - Thermo physical properties -

Electric properties - Electrochemical properties - Optical properties

UNIT V

Applications: Application of Nanostructured materials in biotechnology- electronics- defence - photonics

Books for Study:

1. Introduction to Nanotechnology by Charles P. Poole Jr and Frank J.Owens Wiley India Pvt. Ltd., (2003).
2. Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Guozhong Cao, Imperial College Press (2004).

Books for Reference:

1. Nanocrystals: Synthesis, Properties and Applications, C. N. R. Rao, P. J. Thomas and G. U. Kulkarni, Springer (2007).
2. Physics of semiconductor nanostructures - K. P. Jain, Narosa 1997
3. Nanotechnology - Enabled Sensors, Kourosh Kalantar - zadeh and Benjamin Fry, Springer (2008).
4. Nanocomposite science and technology, Pulickel M. Ajayan, Linda S. Schadler, Paul V. Braun, Wiley-VCH Verlag, Weiheim (2003).
5. Elements of X-Ray Diffraction (second edition, Addison - Wesley, London) B. D. Cullity (1977).
6. Handbook of Microscopy for Nanotechnology, Ed. By Nan Yao and Zhong Lin Wang, Kluwer Academic Press (2005).
7. Nanotechnology: Basic Science and Emerging Technologies – Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Overseas Press (2005).

Related Online Sources:

1. <https://youtu.be/5lvjo0rm-F0>
2. <https://youtu.be/qUEbxTkPIWI>
3. <https://youtu.be/k61wjab7iUs>

Mapping of Course outcomes with Programme Outcomes and Programme Specific Outcomes:

CO/ PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO
CO1	3	3	3	3	2	2	2	3	3	2	2	2	2	2
CO2	3	3	3	3	2	2	2	3	3	2	2	2	2	2
CO3	3	3	3	3	2	2	2	3	3	2	2	2	2	2
CO4	3	3	3	3	2	2	2	3	3	2	2	2	2	2
CO5	3	3	3	3	2	2	2	3	3	2	2	2	2	2

Strongly Correlated - 3; Moderately Correlated - 2;

Weakly Correlated - 1; No Correlation - 0;

MSU / 2021-22 / PG –Colleges / M.Sc Physics/ Semester IV / Ppr.no.25 / Elective – 1 (d)Title of the Course : **RENEWABLE ENERGY SOURCES****Course Outcomes**

At the end of the course, the student will be able to:

Course Outcomes		Cognitive level
CO1	Describe the different types of energy sources in India and world as well	K-2, K-3, K-4
CO2	Explain solar cells and biomass conversion	K-3, K-4
CO3	Enumerate the theory of geothermal and tidal energy conversion	K-3, K-4
CO4	Differentiate thermoelectric and thermionic energy sources	K-3, K-4
CO5	Explore the applications of chemical energy sources	K-2, K-3, K-4, K-5

Cognitive level	Content
K-1	Remember
K-2	Understand
K-3	Apply
K-4	Analyze
K-5	Evaluate
K-6	Create

Course Description

Preamble: This course gives a brief knowledge about the types of various non-conventional energy sources. The societal application of these energy sources is studied.

L	T	C	P
3	0	3	0

Unit I: Introduction

Primary and secondary energy - Commercial and non commercial energy - renewable and non-renewable resources and their importance - World energy use - Indian energy scenario - Long term energy scenario for India.

Unit II: Solar and Biomass Energy

Introduction - extra terrestrial solar radiation - collectors - Solar cells - application of solar energy - Biomass energy - biomass conversion - bio gas production - ethanol production - pyrolysis and gasification - application of biomass energy.

Unit III: Geothermal and Tidal Energy

Introduction - basic theory - geothermal resources types - resource base - application for heating and electricity generation - Tidal energy - Introduction - origin of tides - Power generation scheme.

Unit IV: Other Renewable Energy Sources

Thermoelectric and Thermionic energy resources - basic principles - power generation - nuclear energy - basic principle - power generation (basic ideas only).

Unit V: Chemical Energy Sources

Introduction - fuel cells - design and principle - types - advantages and disadvantages - applications - Batteries - Introduction - Theory - classification of batteries - advantages of batteries for bulk storage.

Books for Study:

1. Non-Conventional Energy Sources, G. D. Rai, Khanna Publishers, New Delhi, 1984

Books for Reference:

1. Solar Energies of thermal processer, A. Duffie and W.A. Beckmann, John - Wiley, 1980.
2. Principle of Solar Engineering, F. Kreith and J. F. Kreider, McGraw-Hill, 1978
3. Alternate Energy Sources, T. N. Veziroglu, Vol.5 and 6, Mc Graw - Hill, 1978.
4. Solar energy - Principle of thermal collection and storage S P Sukhatme and J K Nayak, Tata Mc Graw Hill, Tata, 2008

Related online resources:

1. <https://youtu.be/UJ8XW9AgUrw>
2. https://youtu.be/qSWm_nprfqE
3. <https://youtu.be/ldPTuwKEfmA>

Mapping of Course outcomes with Programme Outcomes and Programme Specific Outcomes:

CO/ PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO
CO1	3	3	3	3	3	3	1	3	3	2	3	2	3	1
CO2	3	3	3	3	3	3	1	3	3	2	3	2	3	1
CO3	3	3	3	3	3	3	1	3	3	2	3	2	3	1
CO4	3	3	3	3	3	3	1	3	3	2	3	2	3	1
CO5	3	3	3	3	3	3	1	3	3	2	3	2	3	1

Strongly Correlated - 3; Moderately Correlated - 2;

Weakly Correlated - 1; No Correlation - 0;

M.Sc. DEGREE COURSE IN PHYSICS COURSE STRUCTURE

FIRST SEMESTER

COURSE COMPONENTS	NAME OF THE COURSE	INST. HRS.	CREDITS	EXAM HRS.	MAX MARKS	
					CIA	EXT.
Core-I	Paper 1- Mathematical Physics	7	5	3	25	75
Core-II	Paper 2 - Classical Mechanics and Relativity	6	5	3	25	75
Core-III	Paper 3 - Linear and Digital ICs and Applications	6	4	3	25	75
Discipline Centric Elective- I	Practical I	6	3	6	50	50
Generic Elective-II:	Choose any one from the list I	5	3	3	25	75
		30	20			

SECOND SEMESTER

COURSE COMPONENTS	NAME OF THE COURSE	INST. HRS.	CREDITS	EXAM HRS.	MAX MARKS	
					CIA	EXT.
Core-IV	Paper 4– Statistical Mechanics	6	5	3	25	75
Core-V	Paper 5 - Quantum Mechanics –I	6	5	3	25	75
Core Practical- II/Core VI	Practical – II	6	4	6	50	50
Discipline Centric Elective- II	Choose any one from the list II	4	3	3	25	75
Generic Elective - II	Choose any one from the lists III	4	3	3	25	75
SEC I	Physics for Competitive Examinations	4	2	3	25	75
		30	22			

ELECTIVE PAPERS**List 1**

1. Energy Physics
2. Crystal Growth and Thin films
3. Analysis of Crystal Structures
4. Materials Science
5. Physics of Nano Science and Technology
6. Digital Communication
7. Communication Electronics

LIST 2

8. Plasma Physics
9. Bio Physics
10. Non-linear Dynamics
11. Quantum Field Theory
12. General Relativity and Cosmology
13. Advanced Optics
14. Advanced Mathematical Physics

LIST 3**INDUSTRY ORIENTED ELECTIVE (IOE)**

15. Advanced Spectroscopy
16. Microprocessor 8086 and Microcontroller 8051
17. Characterization of Materials
18. Medical Physics
19. Solid Waste Management (SWM)
20. Sewage and Waste Water Treatment and Reuse
21. Solar Energy Utilization

Discipline Centric Elective – I - PRACTICAL I	I YEAR - FIRST SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	PRACTICAL I	Core				3	6	50

Pre-Requisites

Knowledge and hands on experience of basic general and electronics experiments of Physics

Learning Objectives

- | |
|---|
| <ul style="list-style-type: none"> ➤ To understand the concept of mechanical behavior of materials and calculation of same using appropriate equations. ➤ To calculate the thermodynamic quantities and physical properties of materials. ➤ To analyze the optical and electrical properties of materials. |
|---|

Course Details

PRACTICAL I

(Choose any **SIX** experiments from Part A and **SIX** from Part B)

PART A

1. Determination of Young's modulus and Poisson's ratio by Hyperbolic fringes - Cornu's Method
2. B-H loop using Anchor ring.
3. Determination of Thickness of the enamel coating on a wire by diffraction
4. Measurement of Band gap energy- Thermistor
5. Determination of Planck Constant – LED Method
6. Determination of Compressibility of a liquid using Ultrasonics
7. Determination of Wavelength, Separation of wavelengths - Michelson Interferometer
8. Measurement of Conductivity - Four probe method.
9. Arc spectrum – Iron.
10. Measurement of wavelength of Diode Laser / He – Ne Laser using Diffraction grating.
11. Determination of Diffraction pattern of light with circular aperture using Diode/He-Ne laser.
12. Measurement of Susceptibility of liquid - Quincke's method
13. UV-Visible spectroscopy – Verification of Beer-Lambert's law and identification of wavelength maxima – Extinction coefficient
14. Anderson's bridge – L_1, L_2, L_s, L_p

PART B

1. Construction of relaxation oscillator using UJT
2. FET CS amplifier- Frequency response, input impedance, output impedance
3. Study of important electrical characteristics of IC741.
4. V- I Characteristics of different colours of LED.
5. Study of attenuation characteristics of Wien's bridge network and design of Wien's bridge oscillator using Op-Amp.
6. Study of attenuation characteristics of Phase shift network and design of Phase shift oscillator using Op-Amp.

<ol style="list-style-type: none"> 7. Construction of Schmidt trigger circuit using IC 741 for a given hysteresis- application as squarer. 8. Construction of square wave Triangular wave generator using IC 741 9. Construction of pulse generator using the IC 741 – application as frequency divider 10. Construction of Op-Amp- 4-bit Digital to Analog converter (Binary Weighted and R/2R ladder type) 11. Study of Binary to Gray and Gray to Binary code conversion. 12. Study of R-S, clocked R-S and D-Flip flop using NAND gates 13. Study of J-K, D and T flip flops using IC 7476/7473 14. Arithmetic operations using IC 7483- 4-bit binary addition and subtraction. 	
TEXT BOOKS	<ol style="list-style-type: none"> 1. Practical Physics, Gupta and Kumar, PragatiPrakasan. 2. Kit Developed for doing experiments in Physics- Instruction manual, R.Srinivasan K.R Priolkar, Indian Academy of Sciences. 3. Electronic Laboratory Primer a design approach, S. Poornachandra, B.Sasikala, Wheeler Publishing, New Delhi. 4. Electronic lab manual Vol I, K ANavas, Rajath Publishing. Electronic lab manual Vol II, K ANavas, PHI eastern Economy Edition
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Advanced Practical Physics, S.P Singh, PragatiPrakasan. 2. An advanced course in Practical Physics, D.Chattopadhyay, C.R Rakshit, New Central Book Agency Pvt. Ltd 3. Op-Amp and linear integrated circuit, Ramakanth A Gaykwad, Eastern Economy Edition. 4. A course on experiment with He-Ne Laser, R.S. Sirohi, John Wiley & Sons (Asia) Pvt. Ltd. Electronic lab manual Vol II, Kuriachan T.D, Syam Mohan, Ayodhya Publishing.

COURSE OUTCOMES:

At the end of the course the student will be able to:

CO1	Understand the strength of material using Young's modulus.	K2
CO2	Acquire knowledge of thermal behavior of the materials.	K1
CO3	Understand theoretical principles of magnetism through the experiments.	K2
CO4	Acquire knowledge about arc spectrum and applications of laser	K1, K3
CO5	Improve the analytical and observation ability in Physics Experiments	K3, K5
CO6	Conduct experiments on applications of FET and UJT	K4
CO7	Analyze various parameters related to operational amplifiers.	K4
CO8	Understand the concepts involved in arithmetic and logical circuits using IC's	K2
CO9	Acquire knowledge about Combinational Logic Circuits and Sequential Logic Circuits	K1
CO10	Analyze the applications of counters and registers	K4
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 – Evaluate		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	2	2	2	1	2	3
CO2	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2
CO6	2	2	2	3	3	1	1	1	3	3
CO7	2	2	3	3	3	1	1	1	3	3
CO8	3	3	3	3	3	3	2	2	3	3
CO9	3	3	3	3	3	3	1	1	1	1
CO10	3	3	3	3	3	3	1	1	1	1

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	2	2	3	2	2	2	1	2	3
CO2	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2
CO6	2	2	2	3	3	1	1	1	3	3
CO7	2	2	3	3	3	1	1	1	3	3
CO8	3	3	3	3	3	3	2	2	3	3
CO9	3	3	3	3	3	3	1	1	1	1
CO10	3	3	3	3	3	3	1	1	1	1

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
50	50	100	

Elective - List 1 – 1. ENERGY PHYSICS	I/II YEAR - FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	ENERGY PHYSICS	ELECTIVE				3	4	75

Pre-Requisites

Knowledge of conventional energy resources

Learning Objectives

- To learn about various renewable energy sources.
- To know the ways of effectively utilizing the oceanic energy.
- To study the method of harnessing wind energy and its advantages.
- To learn the techniques useful for the conversion of biomass into useful energy.
- To know about utilization of solar energy.

UNITS	Course Details
UNIT I: INTRODUCTION TO ENERGY SOURCES	Conventional and non-conventional energy sources and their availability–prospects of Renewable energy sources– Energy from other sources–chemical energy–Nuclear energy– Energy storage and distribution.
UNIT II: ENERGY FROM THE OCEANS	Energy utilization–Energy from tides–Basic principle of tidal power–utilization of tidal energy – Principle of ocean thermal energy conversion systems.
UNIT III: WIND ENERGY SOURCES	Basic principles of wind energy conversion–power in the wind–forces in the Blades– Wind energy conversion–Advantages and disadvantages of wind energy conversion systems (WECS) - Energy storage–Applications of wind energy.
UNIT IV: ENERGY FROM BIOMASS	Biomass conversion Technologies– wet and dry process– Photosynthesis - Biogas Generation: Introduction–basic process: Aerobic and anaerobic digestion – Advantages of anaerobic digestion–factors affecting bio digestion and generation of gas- bio gas from waste fuel– properties of biogas-utilization of biogas.
UNIT V: SOLAR ENERGY SOURCES	Solar radiation and its measurements–solar cells: Solar cells for direct conversion of solar energy to electric powers–solar cell parameter–solar cell electrical characteristics– Efficiency–solar water Heater –solar distillation– solar cooking–solar greenhouse – Solar pond and its applications.
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. G.D. Rai, 1996, Non – convention sources of, 4th edition, Khanna publishers, New Delhi. 2. S. Rao and Dr. ParuLekar, Energy technology. 3. M.P. Agarwal, Solar Energy, S. Chand and Co., New Delhi (1983). 4. Solar energy, principles of thermal collection and storage by S.P.Sukhatme, 2ndedition, Tata McGraw-Hill Publishing Co. Lt., New Delhi (1997). 5. Energy Technology by S.Rao and Dr.Parulekar.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Renewable energy resources, John Twidell and Tonyweir, Taylor and Francis group, London and New York. 2. Applied solar energy, A.B.MeinelandA.P.Meinal 3. John Twidell and Tony Weir, Renewable energy resources, Taylor and Francis group, London and New York. 4. Renewal Energy Technologies: A Practical Guide for Beginners C.S. Solanki-PHI Learning 5. Introduction to Non-Conventional Energy Resources -Raja et. al., Sci. Tech Publications
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.open.edu/openlearn/ocw/mod/oucontent/view.php?id=2411&printable=1 2. https://www.nationalgeographic.org/encyclopedia/tidal-energy/ 3. https://www.ge.com/renewableenergy/wind-energy/what-is-wind-energy 4. https://www.reenergyholdings.com/renewable-energy/what-is-biomass/ 5. https://www.acciona.com/renewable-energy/solar-energy/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	To identify various forms of renewable and non-renewable energy sources	K1
CO2	Understand the principle of utilizing the oceanic energy and apply it for practical applications.	K2
CO3	Discuss the working of a windmill and analyze the advantages of wind energy.	K3
CO4	Distinguish aerobic digestion process from anaerobic digestion.	K3,K4
CO5	Understand the components of solar radiation, their measurement and apply them to utilize solar energy.	K2,K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (**CO**) for each course with program outcomes (**PO**) and program specific outcomes (**PSO**) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	3	3	2	2	2	3	3	3
CO2	2	3	3	3	2	2	2	3	3	3
CO3	2	3	3	3	2	2	2	3	3	3
CO4	2	3	3	3	2	2	2	3	3	3
CO5	2	3	3	3	2	2	2	3	3	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	3	3	3	2	2	2	3	3	3
CO2	2	3	3	3	2	2	2	3	3	3
CO3	2	3	3	3	2	2	2	3	3	3
CO4	2	3	3	3	2	2	2	3	3	3
CO5	2	3	3	3	2	2	2	3	3	3

Elective - List 1 – 2. CRYSTAL GROWTH AND THIN FILMS	I/II YEAR – FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	CRYSTAL GROWTH AND THIN FILMS	ELECTIVE				3	4	75

Pre-Requisites
Fundamentals of Crystal Physics
Learning Objectives
<ul style="list-style-type: none"> ➤ To acquire the knowledge on Nucleation and Kinetics of crystal growth ➤ To understand the Crystallization Principles and Growth techniques ➤ To study various methods of Crystal growth techniques ➤ To understand the thin film deposition methods ➤ To apply the techniques of Thin Film Formation and thickness Measurement

UNITS	Course Details
UNIT I: CRYSTAL GROWTH KINETICS	Basic Concepts, Nucleation and Kinetics of growth Ambient phase equilibrium - super saturation - equilibrium of finite phases equation of Thomson - Gibbs - Types of Nucleation - Formation of critical Nucleus - Classical theory of Nucleation - Homo and heterogeneous formation of 3D nuclei - rate of Nucleation - Growth from vapour phase solutions, solutions and melts - epitaxial growth - Growth mechanism and classification - Kinetics of growth of epitaxial films
UNIT II: CRYSTALLIZATION PRINCIPLES	Crystallization Principles and Growth techniques Classes of Crystal system - Crystal symmetry - Solvents and solutions - Solubility diagram - Super solubility - expression for super saturation - Metastable zone and introduction period - Miers TC diagram - Solution growth - Low and high temperatures solution growth - Slow cooling and solvent evaporation methods - Constant temperature bath as a Crystallizer.
UNIT III: GEL, MELT AND VAPOUR GROWTH	Gel, Melt and Vapour growth techniques Principle of Gel techniques - Various types of Gel - Structure and importance of Gel - Methods of Gel growth and advantages - Melt techniques - Czochralski growth - Floating zone - Bridgeman method - Horizontal gradient freeze - Flux growth - Hydrothermal growth - Vapour phase growth - Physical vapour deposition - Chemical vapour deposition - Stoichiometry.

<p>UNIT IV: THIN FILM DEPOSITION METHODS</p>	<p>Thin film deposition methods of thin film preparation, Thermal evaporation, Electron beam evaporation, pulsed LASER deposition, Cathodic sputtering, RF Magnetron sputtering, MBE, chemical vapour deposition methods, Sol Gel spin coating, Spray pyrolysis, Chemical bath deposition.</p>
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<p>UNIT V: THIN FILM FORMATION</p>	<p>Thin Film Formation and thickness Measurement Nucleation, Film growth and structure - Various stages in Thin Film formation, Thermodynamics of Nucleation, Nucleation theories, Capillarity model and Atomistic model and their comparison. Structure of Thin Film, Roll of substrate, Roll of film thickness, Film thickness measurement - Interferometry, Ellipsometry, Micro balance, Quartz Crystal Oscillator techniques.</p>
<p>UNIT VI: PROFESSIONAL COMPONENTS</p>	<p>Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism</p>
<p>TEXT BOOKS</p>	<ol style="list-style-type: none"> 1. V. Markov Crystal growth for beginners: Fundamentals of Nucleation, Crystal Growth and Epitaxy (2004) 2nd edition 2. A. Goswami, Thin Film Fundamentals (New Age, New Delhi, 2008) 3. M. Ohora and R. C. Reid, "Modeling of Crystal Growth Rates from Solution" 4. D. Elwell and H. J. Scheel, "Crystal Growth from High Temperature Solution" 5. Heinz K. Henish, 1973, "Crystal Growth in Gels", Cambridge University Press. USA.
<p>REFERENCE BOOKS</p>	<ol style="list-style-type: none"> 1. J.C. Brice, Crystal Growth Process (John Wiley, New York, 1986) 2. P. Ramasamy and F. D. Gnanam, 1983, "UGC Summer School Notes". 3. P. SanthanaRaghavan and P. Ramasamy, "Crystal Growth Processes", KRU Publications. 4. H.E. Buckley, 1951, Crystal Growth, John Wiley and Sons, New York 5. B.R. Pamplin, 1980, Crystal Growth, Pergman Press, London.
<p>WEB SOURCES</p>	<ol style="list-style-type: none"> 1. https://www.youtube.com/playlist?list=PLbMVogVj5nJRjLrXp3kMtrI08kZl1D1Jp 2. https://www.youtube.com/playlist?list=PLFW6lRTa1g83HGEihgwcY7KeTLUuBu3WF 3. https://www.youtube.com/playlist?list=PLADLRin7kNjG1Dlna9MDA53CMKFHPSi9m 4. https://www.youtube.com/playlist?list=PLXHedI-xbyr8xII_KQFs_R_oky3Yd1Emw 5. https://www.electrical4u.com/thermal-conductivity-of-metals/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Acquire the Basic Concepts, Nucleation and Kinetics of crystal growth	K1
CO2	Understand the Crystallization Principles and Growth techniques	K2, K4
CO3	Study various methods of Crystal growth techniques	K3
CO4	Understand the Thin film deposition methods	K2
CO5	Apply the techniques of Thin Film Formation and thickness Measurement	K3, K4
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	1	3	2	2	2	2
CO2	3	3	1	3	1	2	3	2	2	1
CO3	3	2	1	3	1	2	3	3	3	1
CO4	3	2	1	2	1	2	3	3	3	1
CO5	2	3	3	3	1	3	3	3	3	2

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	1	2	1	3	2	2	2	2
CO2	3	3	1	3	1	2	3	2	2	1
CO3	3	2	1	3	1	2	3	3	3	1
CO4	3	2	1	2	1	2	3	3	3	1
CO5	2	3	3	3	1	3	3	3	3	2

Elective - List 1 – 3. ANALYSIS OF CRYSTAL STRUCTURES	I/II YEAR – FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	ANALYSIS OF CRYSTAL STRUCTURES	ELECTIVE				3	4	75

Pre-Requisites
Fundamentals of crystal structures, symmetry and X-Ray Diffraction techniques
Learning Objectives
<ul style="list-style-type: none"> ➤ To teach the concept of crystal structures and symmetry, and diffraction theory ➤ To provide students with a background to X-ray generation, scattering theory and experimental diffraction from single crystals ➤ To provide instruction on the methods and basis for determining low-molecular weight crystal structures using X-ray Crystallography ➤ To give the students a background to the instrumentation used for powder diffraction and structure refinement using Rietveld method ➤ To teach the different levels of structure exhibited by proteins and nucleic acids and methods used in protein crystallography.

UNITS	Course details
UNIT I: CRYSTAL LATTICE	Unit cell and Bravais lattices - crystal planes and directions - basic symmetry elements operations - translational symmetries - point groups - space groups - equivalent positions - Bragg's law - reciprocal lattice concept - Laue conditions - Ewald and limiting spheres - diffraction symmetry - Laue groups.
UNIT II: DIFFRACTION	X-ray generation, properties - sealed tube, rotating anode, synchrotron radiation - absorption - filters and monochromators Atomic scattering factor - Fourier transformation and structure factor - anomalous dispersion - Laue, rotation/oscillation, moving film methods- interpretation of diffraction patterns - cell parameter determination - systematic absences - space group determination.
UNIT III: STRUCTURE ANALYSIS	Single crystal diffractometers - geometries - scan modes - scintillation and area detectors - intensity data collection - data reduction - factors affecting X-ray intensities - temperature and scale factor - electron density - phase problem - normalized structure factor - direct method fundamentals and procedures - Patterson function and heavy atom method - structure refinement - least squares method - Fourier and difference Fourier synthesis - R factor - structure interpretation - geometric calculations - conformational studies - computer program packages.
UNIT IV: POWDER METHODS	Fundamentals of powder diffraction - Debye Scherrer method - diffractometer geometries - use of monochromators and Soller slits - sample preparation and data collection - identification of unknowns - powder diffraction files (ICDD) - Rietveld refinement fundamentals - profile analysis - peak shapes - whole pattern fitting - structure refinement procedures - auto-indexing - structure determination from powder data - new developments. Energy dispersive X-ray analysis - texture studies -

	crystallite size determination - residual stress analysis - high and low temperature and high pressure crystallography (basics only).
UNIT V: PROTEIN CRYSTALLOGR APHY	Globular and fibrous proteins, nucleic acids - primary, secondary, tertiary and quaternary structures - helical and sheet structures - Ramachandran map and its significance – crystallization methods for proteins - factors affecting protein crystallization - heavy atom derivatives – methods used to solve protein structures - anomalous dispersion methods.
UNIT VI: PROFESSIONA L COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism.
TEXT BOOKS	<ol style="list-style-type: none"> 1. Azaroff, L.V., "Elements of X-Ray Crystallography", Techbooks, New York, 1992. 2. Blundell, T.L. and Johnson, L., "Protein Crystallography", Academic Press, New York, 1986. 3. Cullity, B.D. and Stock, S.R. "Elements of X-ray Diffraction", Pearson, 2014. 4. H.L. Bhat, Introduction to Crystal Growth Principles and Practice CRC Press, Taylor & Francis Group, Boca Raton, Florida, 2015. 5. B.R. Pamplin, Crystal Growth, Pergamon Press, Oxford, 1975.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Glusker, J.P. and Trueblood, K.N. Crystal Structure Analysis: A Primer", Oxford University Press, New York, 1994. 2. Ladd, M.F.C. and Palmer, R.A., "Structure Determination by X-ray Crystallography", Plenum Press, New York, 3rd Edition, 1993. 3. Stout, G.H. and Jensen, L. "X-ray Structure Determination, A Practical Guide", Macmillan, New York, 1989. 4. Woolfson, M.M. "An Introduction to X-ray Crystallography" Cambridge University Press, New York, 1997. 5. Sam Zhang, Lin Ki, Ashok Kumar, Materials Characterization Techniques, CRC Press, Taylor & Francis Group, Boca Raton, Florida, 2009
WEB SOURCES	<ol style="list-style-type: none"> 1. https://archive.nptel.ac.in/courses/112/106/112106227/ 2. https://archive.nptel.ac.in/courses/104/108/104108098/ 3. https://www.digimat.in/nptel/courses/video/102107086/L11.html 4. https://onlinecourses.nptel.ac.in/noc19_cy35/previewhttps://onlinecourses.nptel.ac.in/noc19_cy35/preview 5. https://nptel.ac.in/courses/104/104/104104011/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Understand crystal symmetry and reciprocal lattice concept for X-ray diffraction	K2
CO2	Gain a working knowledge of X-ray generation, X-ray photography with Laue, oscillation and moving film methods, and space group determination	K1, K3
CO3	Get an exposure to crystal structure determination using program packages	K1, K4
CO4	Understand the instrumentation used for powder diffraction, data collection, data interpretation, and structure refinement using Rietveld method	K2, K4
CO5	Get an insight into the structural aspects of proteins and nucleic acids, crystallization of proteins and methods to solve protein structures	K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

Elective - List 1 – 4. MATERIALS SCIENCE	I/II YEAR - FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	MATERIALS SCIENCE	ELECTIVE				3	4	75

Pre-Requisites
➤ Basic knowledge on different types of materials
Learning Objectives
<ul style="list-style-type: none"> ➤ To gain knowledge on optoelectronic materials ➤ To learn about ceramic processing and advanced ceramics ➤ To understand the processing and applications of polymeric materials ➤ To gain knowledge on the fabrication of composite materials ➤ To learn about shape memory alloys, metallic glasses and nanomaterials

UNITS	Course details
UNIT I: OPTOELECTRONIC MATERIALS	Importance of optical materials – properties: Band gap and lattice matching – optical absorption and emission – charge injection, quasi-Fermi levels and recombination – optical absorption, loss and gain. Optical processes in quantum structures: Inter-band and intra-band transitions Organic semiconductors. Light propagation in materials – Electro-optic effect and modulation, electro-absorption modulation – exciton quenching.
UNIT II CERAMIC MATERIALS	Ceramic processing: powder processing, milling and sintering – structural ceramics: zirconia, alumina, silicon carbide, tungsten carbide – electronic ceramics – refractories – glass and glass ceramics
UNIT III POLYMERIC MATERIALS	Polymers and copolymers – molecular weight measurement – synthesis: chain growth polymerization – polymerization techniques – glass transition temperature and its measurement – viscoelasticity – polymer processing techniques – applications: conducting polymers, biopolymers and high temperature polymers.
UNIT IV COMPOSITE MATERIALS	Particle reinforced composites – fiber reinforced composites – mechanical behavior – fabrication methods of polymer matrix composites and metal matrix composites – carbon/carbon composites: fabrication and applications.
UNIT V: NEW MATERIALS	Shape memory alloys: mechanisms of one-way and two-way shape memory effect, reverse transformation, thermo-elasticity and pseudo-elasticity, examples and applications -bulk metallic glass: criteria for glass formation and stability, examples and mechanical behavior - nanomaterials: classification, size effect on structural and functional properties, processing and properties of Nano crystalline materials, single walled and multi walled carbon nanotubes

UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. Jasprit Singh, Electronic and optoelectronic properties of semiconductor structures, Cambridge University Press, 2007 2. P. K. Mallick. Fiber-Reinforced Composites. CRC Press, 2008. 3. V. Raghavan, 2003, Materials Science and Engineering, 4th Edition, Prentice- Hall India, New Delhi(For units 2,3,4 and 5) 4. G.K. Narula, K.S. Narula and V.K. Gupta, 1988, Materials Science, Tata McGraw-Hill 5. M. Arumugam, 2002, Materials Science, 3rd revised Edition, Anuratha Agencies
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. B. S. Murty, P. Shankar, B. Raj, B. B. Rath and J. Murday. Textbook of Nanoscience and Nanotechnology. Springer- Verlag, 2012. 2. K. Yamauchi, I. Ohkata, K. Tsuchiya and S. Miyazaki (Eds). Shape Memory and Super Elastic Alloys: Technologies and Applications. Wood head Publishing Limited, 2011. 3. Lawrence H. VanVlack, 1998. Elements of Materials Science and Engineering, 6th Edition, Second ISE reprint, Addison-Wesley. 4. H. Iabch and H. Luth, 2002, Solid State Physics – An Introduction to Principles of Materials Science, 2nd Edition, Springer. 5. D. Hull & T. W. Clyne, An introduction to composite materials, Cambridge University Press, 2008.
WEB SOURCES	<ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc20_mm02/preview 2. https://nptel.ac.in/courses/112104229 3. https://archive.nptel.ac.in/courses/113/105/113105081 4. https://nptel.ac.in/courses/113/105/113105025/ https://eng.libretexts.org/Bookshelves/Materials_Science/Supplemental_Modules_(Materials_Science)/Electronic_Properties/Lattice_Vibrations

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Acquire knowledge on optoelectronic materials	K1
CO2	Be able to prepare ceramic materials	K3
CO3	Be able to understand the processing and applications of polymeric materials	K2, K3
CO4	Be aware of the fabrication of composite materials	K5
CO5	Be knowledgeable of shape memory alloys, metallic glasses and nanomaterials	K1
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

Elective - List 1 – 5. PHYSICS OF NANOSCIENCE AND TECHNOLOGY	I/II YEAR – FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	PHYSICS OF NANOSCIENCE AND TECHNOLOGY	ELECTIVE				3	4	75

Pre-Requisites
Basic knowledge in Solid State Physics
Learning Objectives
<ul style="list-style-type: none"> ➤ Physics of Nanoscience and Technology is concerned with the study, creation, manipulation and applications at nanometer scale. ➤ To provide the basic knowledge about nanoscience and technology. ➤ To learn the structures and properties of nanomaterials. ➤ To acquire the knowledge about synthesis methods and characterization techniques and its applications.

UNITS	Course Details
UNIT I: FUNDAMENTALS OF NANOSCIENCE AND TECHNOLOGY	Fundamentals of NANO – Historical Perspective on Nanomaterial and Nanotechnology -- Classification of Nanomaterials – Metal and Semiconductor Nanomaterials - 2D, 1D, 0D nanostructured materials - Quantum dots – Quantum wires – Quantum wells - Surface effects of nanomaterials.
UNIT II: PROPERTIES OF NANOMATERIALS	Physical properties of Nanomaterials: Melting points, specific heat capacity, and lattice constant - Mechanical behavior: Elastic properties – strength - ductility - superplastic behavior - Optical properties: - Surface Plasmon Resonance – Quantum size effects - Electrical properties - Conductivity, Ferroelectrics and dielectrics - Magnetic properties – super para magnetism – Diluted magnetic semiconductor (DMS).
UNIT III: SYNTHESIS AND FABRICATION	Physical vapour deposition - Chemical vapour deposition - sol-gel – Wet deposition techniques - electrochemical deposition method – Plasma arching - Electrospinning method - ball milling technique - pulsed laser deposition - Nanolithography: photolithography – Nanomanipulator.
UNIT IV: CHARACTERIZATION TECHNIQUES	Powder X-ray diffraction – X-ray photoelectron spectroscopy (XPS) - UV-visible spectroscopy – Photoluminescence - Scanning electron microscopy (SEM) - Transmission electron microscopy (TEM) - Scanning probe microscopy (SPM) - Scanning tunneling microscopy (STM) – Vibrating sample Magnetometer.

<p align="center">UNIT V: APPLICATIONS OF NANOMATERIALS</p>	<p>Sensors: Nanosensors based on optical and physical properties - Electrochemical sensors – Nano-biosensors. Nano Electronics: Nanobots - display screens - GMR read/write heads - Carbon Nanotube Emitters – Photocatalytic application: Air purification, water purification -Medicine: Imaging of cancer cells – biological tags - drug delivery - photodynamic therapy - Energy: fuel cells - rechargeable batteries - supercapacitors - photovoltaics.</p>
<p align="center">UNIT VI: PROFESSIONAL COMPONENTS</p>	<p>Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism</p>

<p align="center">TEXT BOOKS</p>	<ol style="list-style-type: none"> 1. A textbook of Nanoscience and Nanotechnology, Pradeep T., Tata McGraw-Hill Publishing Co. (2012). 2. Principles of Nanoscience and Nanotechnology, M.A. Shah, Tokeer Ahmad, Narosa Publishing House Pvt Ltd., (2010). 3. Introduction to Nanoscience and Nanotechnology, K. K. Chattopadhyay and A.N. Banerjee, PHI Learning Pvt. Ltd., New Delhi, (2012). 4. Nanostructured Materials and Nanotechnology, Hari Singh Nalwa, Academic Press, (2002). 5. Nanotechnology and Nanoelectronics, D.P. Kothari, V. Velmurugan and Rajit Ram Singh, Narosa Publishing House Pvt.Ltd, New Delhi. (2018)
<p align="center">REFERENCE BOOKS</p>	<ol style="list-style-type: none"> 1. Nanostructures and Nanomaterials – HuozhongGao – Imperial College Press (2004). 2. Richard Booker and Earl Boysen, (2005) Nanotechnology, Wiley Publishing Inc. USA 3. Nano particles and Nano structured films; Preparation, Characterization and Applications, J.H.Fendler John Wiley and Sons. (2007) 4. Textbook of Nanoscience and Nanotechnology, B.S.Murty, et al., Universities Press. (2012) 5. The Nanoscope (Encyclopedia of Nanoscience and Nanotechnology), Dr. Parag Diwan and Ashish Bharadwaj (2005) Vol. IV - Nanoelectronics Pentagon Press, New Delhi.
<p align="center">WEB SOURCES</p>	<ol style="list-style-type: none"> 1. www.its.caltec.edu/feyman/plenty.html 2. http://www.library.ualberta.ca/subject/nanoscience/guide/index.cfm 3. http://www.understandingnano.com 4. http://www.nano.gov 5. http://www.nanotechnology.com

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Understand the basic of nanoscience and explore the different types of nanomaterials and should comprehend the surface effects of the nanomaterials.	K1, K2
CO2	Explore various physical, mechanical, optical, electrical and magnetic properties of nanomaterials.	K1
CO3	Understand the process and mechanism of synthesis and fabrication of nanomaterials.	K2, K3
CO4	Analyze the various characterization of Nano-products through diffraction, spectroscopic, microscopic and other techniques.	K4
CO5	Apply the concepts of nanoscience and technology in the field of sensors, robotics, purification of air and water and in the energy devices.	K3
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	1	1	3	3	3	3
CO2	3	3	3	2	1	1	3	3	3	3
CO3	3	3	2	2	1	1	3	3	3	3
CO4	3	3	3	2	1	1	3	3	3	3
CO5	3	3	2	2	1	1	3	3	3	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	1	1	3	3	3	3
CO2	3	3	3	2	1	1	3	3	3	3
CO3	3	3	2	2	1	1	3	3	3	3
CO4	3	3	3	2	1	1	3	3	3	3
CO5	3	3	2	2	1	1	3	3	3	3

Elective - List 1 – 6. DIGITAL COMMUNICATION	I/II YEAR - FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	DIGITAL COMMUNICATION	ELECTIVE				3	4	75

Pre-Requisites

Exposure to Fourier transform, pulse modulation, multiplexing, noises in communication signals
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Learning Objectives

- | |
|--|
| <ul style="list-style-type: none"> ➤ To understand the use of Fourier, transform in analyzing the signals ➤ To learn about the quanta of transmission of information ➤ To make students familiar with different types of pulse modulation ➤ To have an in depth knowledge about the various methods of error controlling codes ➤ To acquire knowledge about spread spectrum techniques in getting secured communication |
|--|

UNITS	Course Details
UNIT I: SIGNAL ANALYSIS	Fourier transforms of gate functions, delta functions at the origin – Two delta function and periodic delta function – Properties of Fourier transform – Frequency shifting –Time shifting - Convolution –Graphical representation – Convolution theorem – Time Convolution theorem – Frequency Convolution theorem –Sampling theorem.
UNIT II: INFORMATION THEORY	Communication system – Measurement of information – Coding – Bandot Code CCITT Code –Hartley Law – Noise in an information Carrying Channel- Effects of noise- Capacity of noise in a channel – Shannon Hartley theorem –Redundancy.
UNIT III: PULSE MODULATION	Pulse amplitude modulation - natural sampling – Instantaneous sampling - Transmission of PAM Signals -Pulse width modulation – Time division multiplexing – Band width requirements for PAM Signals. Pulse Code Modulation –Principles of PCM –Quantizing noise – Generation and demodulation of PCM -Effects of noise –Companding – Advantages and application
UNIT IV: ERROR CONTROL CODING	Introduction to Linear Block Codes, Hamming Codes, BCH Coding, RS Coding, Convolutional Coding, Coding Grain Viterbi Coding
UNIT V: SPREAD SPECTRUM SYSTEMS	Pseudo Noise sequences, generation and Correlation properties, direct sequence spread spectrum systems, frequency HOP Systems, processing gain, anti-jam and multipath performance
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. B.P. Lathi, <i>Communication system</i>, Wiley Eastern. 2. George Kennedy, <i>Electronic Communication Systems</i>, 3rd Edition, Mc Graw Hill. 3. Simon Haykin, <i>Communication System</i>, 3rd Edition, John Wiley & Sons. 4. George Kennedy and Davis, 1988, <i>Electronic Communication System</i>, Tata McGraw Hill 4th Edition. 5. Taub and Schilling, 1991, “<i>Principles of Communication System</i>”, Second edition Tata McGraw Hill.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. John Proakis, 1995, <i>Digital Communication</i>, 3rd Edition, McGraw Hill, Malaysia. 2. M. K. Simen, 1999, <i>Digital Communication Techniques, Signal Design and Detection</i>, Prentice Hall of India. 3. Dennis Roddy and Coolen, 1995, <i>Electronics communications</i>, Prentice Hall of India IV Edition. 4. Wave Tomasi, 1998, “<i>Advanced Electronics communication System</i>” 4th Edition Prentice Hall, Inc. 5. M.Kulkarni, 1988, “<i>Microwave and Radar Engineering</i>”, Umesh Publications.
WEB SOURCES	<ol style="list-style-type: none"> 1. http://nptel.iitm.ac.in/ 2. http://web.ewu.edu/ 3. http://www.ece.umd.edu/class/enee630.F2012.html 4. http://www.atcourses.com/Advanced%20Topics%20in%20Digital%20Signals 5. http://nptel.iitm.ac.in/courses/117101051.html

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Apply the techniques of Fourier transform, convolution and sampling theorems in signal processing	K1, K3
CO2	Apply different information theories in the process of study of coding of information, storage and communication	K3
CO3	Explain and compare the various methods of pulse modulation techniques	K4
CO4	Apply the error control coding techniques in detecting and correcting errors- able to discuss, analyze and compare the different error control coding	K3, K4
CO5	Apply, discuss and compare the spread spectrum techniques for secure communications	K3, k5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	2	2	3	2	2	3
CO2	3	3	3	1	2	2	3	2	2	3
CO3	3	3	3	1	2	2	3	2	2	3
CO4	3	3	3	1	2	2	3	2	2	3
CO5	3	3	3	1	2	2	3	2	2	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	1	2	2	3	2	2	3
CO2	3	3	3	1	2	2	3	2	2	3
CO3	3	3	3	1	2	2	3	2	2	3
CO4	3	3	3	1	2	2	3	2	2	3
CO5	3	3	3	1	2	2	3	2	2	3

Elective List 1 – 7. COMMUNICATION ELECTRONICS	I/II YEAR – FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	COMMUNICATION ELECTRONICS	ELECTIVE				3	4	75

Pre-Requisites
Knowledge of Regions of electromagnetic spectrum and its characteristics
Learning Objectives
<ul style="list-style-type: none"> ➤ To comprehend the transmission of electromagnetic waves thorough different types of antenna and also to acquire knowledge about the propagation of waves through earth's atmosphere and along the surface of the earth ➤ To gain knowledge in the generation and propagation of microwaves ➤ To acquire knowledge about radar systems and its applications and also the working principle of colour television ➤ To learn the working principle of fiber optics and its use in telecommunication ➤ To understand the general theory and operation of satellite communication systems

UNITS	Course Details
UNIT I: ANTENNAS AND WAVE PROPAGATION	Radiation field and radiation resistance of short dipole antenna-grounded antenna-ungrounded antenna-antenna arrays-broadside and end side arrays-antenna gain-directional high frequency antennas-sky wave-ionosphere- Eccles and Larmor theory- Magnento ionic theory-ground wave propagation
UNIT II: MICROWAVES	Microwave generation—multicavity Klystron-reflex klystron-magnetrontravelling wave tubes (TWT) and other microwave tubes-MASER-Gunndiode-wave guides-rectangular wave guides-standing wave indicator andstanding wave ratio(SWR)
UNIT III: RADAR AND TELEVISION	Elements of a radar system-radar equation-radar performance Factorsradar transmitting systems-radar antennas-duplexers-radarreceivers and indicators-pulsed systems-other radar systems-colourTVtransmission and reception-colour mixing principle-colour picture tubes-Delta gun picture tube-PIL colour picture tube-cable TV, CCTV andtheatre TV
UNIT IV: OPTICAL FIBER	Propagation of light in an optical fibre-acceptance angle-numericalaperture-step and graded index fibres-optical fibres as a cylindrical waveguide-wave guide equations-wave guide equations in step index fibres -fibre losses and dispersion-applications
UNIT V: SATELLITE COMMUNICATION	Orbital satellites-geostationary satellites-orbital patterns-satellite systemlink models-satellite system parameters-satellite system link equationlinkbudget-INSAT communication satellites

UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. Handbook of Electronics by Gupta and Kumar, 2008 edition. 2. Electronic communication systems – George Kennedy and Davis, Tata McGraw Hill, 4th edition, 1988. 3. Taub and Schilling, principles of communication systems, second edition, Tata Mc Graw Hill (1991). 4. M. Kulkarani, Microwave and radar engineering, UmeshPublications, 1998. 5. Mono Chrome and colour television, R. R. Ghulathi
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Electronic communications – Dennis Roody and Coolen, Prentice Hall of India, IV edition, 1995. 2. Wayne Tomasi, Advanced electronics communication systems, fourth edition, Prentice Hall of India, 1998 3. Dennis Roddy and Coolen, 1995, <i>Electronics communications</i>, Prentice Hall of India IV Edition. 4. Wayne Tomasi, 1998 “<i>Advanced Electronics communication System</i>” 4th edition, Prentice Hall of India, 1998 5. S. Salivahanan, N. Suersh Kumar & A. Vallavaraj, 2009, <i>Electronic Devices and Circuits</i>, Tata McGraw-Hill Publishing Company Limited, New Delhi, Second Edition.
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/ 2. https://www.polytechnichub.com/difference-analog-instruments-digital-instruments/ 3. http://nptel.iitm.ac.in/ 4. http://web.ewu.edu/ 5. http://nptel.iitm.ac.in/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Discuss and compare the propagation of electromagnetic waves through sky and on earth's surface Evaluate the energy and power radiated by the different types of antenna	K1, K5
CO2	Compare and differentiate the methods of generation of microwaves analyze the propagation of microwaves through wave guides- discuss and compare the different methods of generation of microwaves	K4
CO3	Classify and compare the working of different radar systems- apply the principle of radar in detecting locating, tracking, and recognizing objects of various kinds at considerable distances – discuss the importance of radar in military- elaborate and compare the working of different picture tube	K3
CO4	Classify, discuss and compare the different types of optical fiber and also to justify the need of it-discover the use of optical fiber as wave guide	K1, K3
CO5	Explain the importance of satellite communication in our daily life-distinguish between orbital and geostationary satellites elaborate the linking of satellites with ground station on the earth	K4
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	2	2	3	2	1	3
CO2	3	3	3	1	2	2	3	2	1	3
CO3	3	3	3	1	2	2	3	2	1	3
CO4	3	3	3	1	2	2	3	2	1	3
CO5	3	3	3	1	2	2	3	2	1	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	1	2	2	3	2	1	3
CO2	3	3	3	1	2	2	3	2	1	3
CO3	3	3	3	1	2	2	3	2	1	3
CO4	3	3	3	1	2	2	3	2	1	3
CO5	3	3	3	1	2	2	3	2	1	3

Elective List 1 – 8.ASTROPHYSICS	I/II YEAR – FIRST/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	ASTROPHYSICS	ELECTIVE				3	4	75

Pre-Requisites
Fundamental knowledge about electromagnetic spectrum, wave nature of light and about the universe and the galaxy where we live in.
Learning Objectives
<ul style="list-style-type: none"> ➤ To impart knowledge on the physical universe and its evolution. ➤ To make the student to understand fundamental principles and techniques of astronomy and astrophysics. ➤ To make the student to study electromagnetic radiation from stars, atomic spectra and classification of stars. ➤ To provide information about the properties and the evolution of stars. ➤ To render information about astronomical instrumentation.

UNITS	Course Details
UNIT I: OBSERVATIONAL ASTRONOMY	The electromagnetic spectrum; geometrical optics (ray diagrams, focal length, magnification etc); diffraction (resolving power, Airy disc, diffraction limit etc); telescopes (reflecting, refracting, multiwavelength)
UNIT II: PROPERTIES OF STARS	Brightness (luminosities, fluxes and magnitudes); colours (black body radiation, the Planck, Stefan-Boltzmann and Wien's laws, effective temperature, interstellar reddening); spectral types; spectral lines (Bohr model, Lyman & Balmer series etc, Doppler effect); Hertzsprung-Russell diagram; the main sequence (stellar masses ,binary systems, Kepler's laws, mass-luminosity relations); distances to stars (parallax, standard candles, P-L relationships, ms-fitting etc); positions of stars (celestial sphere, coordinate systems, proper motions, sidereal and universal time).
UNIT III: THE LIFE AND DEATH OF STARS	Energy source (nuclear fusion, p-chain, triple-alpha, CNO cycle, lifetime of the Sun); solar neutrinos; basic stellar structure hydro static equilibrium, equation of state); evolution beyond the main sequence; formation of the heavy elements; supernovae; stellar remnants(white dwarfs, neutron stars, black holes, degeneracy pressure, Swarschild radius, escape velocities).
UNIT IV: GALAXIES	Constituents of galaxies; stellar populations; the interstellar medium; HII regions; 21cm line; spirals and ellipticals; galactic dynamics; galaxy rotation curves and dark matter ; active galaxies and quasars.

UNIT V: COSMOLOGY	Galaxies and the expanding Universe; Hubble's Law; the age of the Universe; the Big Bang; cosmic microwave background (black body radiation); big bang nucleosynthesis (cosmic abundances, binding energies, matter & radiation); introductory cosmology (the cosmological principle, homogeneity and isotropy, Olber's paradox); cosmological models (critical density, geometry of space, the fate of the Universe); dark energy and the accelerating Universe.
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. Zeilik & Gregory, Introductory Astronomy & Astrophysics, 4th edition (Saunders College Publishing) 2. Morison, I., Introduction to Astronomy and Cosmology, (Wiley) 3. Kutner, M.L., Astronomy: A Physical Perspective (Cambridge University Press) 4. Green, S.F. & Jones, M.H., An Introduction to the Sun and Stars (Cambridge University Press)
REFERENCE BOOKS	<ol style="list-style-type: none"> 5. Jones, M.H. & Lambourne, R.J.A., An Introduction to Galaxies & Cosmology (Cambridge University Press) 6. Carroll, B.W. & Ostlie, D.A., An Introduction to Modern Astrophysics (Pearson) 7. Shu, F.H., The Physical Universe, An Introduction to Astronomy, (University Science Books) 8. Motz, L. & Duveen, A., The Essentials of Astronomy, (Columbia University Press)
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.coursera.org/courses?query=astrophysics 2. https://www.space.com 3. https://www.britanica.com 4. https://science.nasa.gov 5. https://merriam-webster.com

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Recall and understand the electromagnetic radiation from celestial objects. Analyze the wave nature of light in the form of ray diagram. Apply the knowledge of phenomenon of diffraction and assess, how diffraction limits the resolution of any system having a lens or mirror. Distinguish between reflecting and refracting telescopes and their usage.	K1 K2 K3 K4 K5
CO2	Correlate luminosity, flux and magnitude, related to the brightness of a star. Analyze the evolution of stars using HR diagram. Apply and examine the various laws related to temperature of a star. Assess the distance of stars, measured using trigonometric parallax method. Understand the position of star in the celestial sphere. Distinguish between sidereal and universal time.	K1 K2 K3 K4 K5
CO3	Define nuclear fusion, which is the fundamental energy source of stars. Analyze, how neutrinos are born during the process of nuclear fusion in the sun. Recall and explain the CNO cycle – the main source of energy of hotter stars. Comprehend stellar evolution, including red giants, supernovas, neutron stars, pulsars, white dwarfs and black holes, using evidence and presently accepted theories	K1 K2 K3 K4
CO4	Remember and illustrate the structure of our Milky way galaxy. Classify the types of galaxies. Understand the presence of dark matter in the universe. Explain, how quasars and active galaxies are powered by supermassive black holes which produce copious luminosity.	K1 K2 K3 K4
CO5	Explain cosmology, a branch of astronomy that involves the origin and evolution of the universe, from the Big Bang to today and on into the future. Define Hubble's law of cosmic expansion. Analyze and assess the big bang nucleosynthesis universe that explains the relative	K1 K2 K3 K4 K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	1	2	1	3	2	1	2
CO2	3	2	3	1	2	1	3	2	1	2
CO3	3	2	3	1	2	1	3	2	1	2
CO4	3	2	3	1	2	1	3	2	1	2
CO5	3	2	3	1	2	1	3	2	1	2

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	1	2	1	3	2	1	2
CO2	3	2	3	1	2	1	3	2	1	2
CO3	3	2	3	1	2	1	3	2	1	2
CO4	3	2	3	1	2	1	3	2	1	2
CO5	3	2	3	1	2	1	3	2	1	2

Elective - List 2 – 9. PLASMA PHYSICS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	PLASMA PHYSICS	ELECTIVE				3	4	75

Pre-Requisites

Fundamentals of Electricity and Magnetism, Electromagnetic theory, Maxwell's equation, Basic knowledge of electrical and electronics instrumentation.

Learning Objectives

- To explore the plasma universe by means of in-site and ground-based observations.
- To understand the model plasma phenomena in the universe.
- To explore the physical processes which occur in the space environment.

UNITS	Course Details
UNIT I: FUNDAMENTAL CONCEPTS OF PLASMA	Kinetic pressure in a partially ionized - mean free path and collision cross section - Mobility of charged particles - Effect of magnetic field on the mobility of ions and electrons-Thermal conductivity- Effect of magnetic field- Quasi- neutrality of plasma Debye shielding distance - Optical properties of plasma.
UNIT II: MOTION OF CHARGED PARTICLES IN ELECTRIC AND MAGNETIC FIELD	Particle description of plasma- Motion of charged particle in electrostatic field- Motion of charged particle in uniform magnetic field - Motion of charged particle in electric and magnetic fields- Motion of charged particle in inhomogeneous magnetic field - Motion of charged particle in magnetic mirror confinement - motion of an electron in a time varying electric field- Magneto- hydrodynamics - Magneto-hydrodynamic equations – Condition for magneto hydrodynamic behaviour.
UNIT III: PLASMA OSCILLATIONS AND WAVES	Introduction, theory of simple oscillations - electron oscillation in a plasma – Derivations of plasma oscillations by using Maxwell's equation - Ion oscillation and waves in a magnetic field - thermal effects on plasma oscillations - Landau damping - Hydro magnetic waves - Oscillations in an electron beam.
UNIT IV: PLASMA DIAGNOSTICS TECHNIQUES	Single probe method - Double probe method - Use of probe technique for measurement of plasma parameters in magnetic field - microwave method - spectroscopic method - laser as a tool for plasma diagnostics-X-ray diagnostics of plasma - acoustic method - conclusion.
UNIT V: APPLICATIONS OF PLASMA PHYSICS	Magneto hydrodynamic Generator - Basic theory - Principle of Working-Fuel in MHD Generator - Generation of Microwaves Utilizing High Density Plasma - Plasma Diode.
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. Plasma Physics- Plasma State of Matter - S. N.Sen, PragatiPrakashan, Meerut. 2. Introduction to Plasma Physics-M. Uman 3. Krall, N. A., and A. W. Trivelpiece. Principles of Plasma Physics. Berkeley, CA: San Francisco Press, 1986. ISBN: 9780911302585.Tanenbaum, B. S. Plasma Physics. New York, NY: McGraw-Hill, 1967. ISBN: 9780070628120. 4. Goldston, R. J., and P. H. Rutherford. Introduction to Plasma Physics. Philadelphia, PA: IOP Publishing, 1995. ISBN: 9780750301831. 5. Hutchinson, I. H. Principles of Plasma Diagnostics. Cambridge, UK: Cambridge University Press, 2005. ISBN: 9780521675741.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Chen, F. F. Introduction to Plasma Physics. 2nd ed. New York, NY: Springer, 1984. ISBN: 9780306413322. 2. Introduction to Plasma Theory-D.R. Nicholson 3. Shohet, J. L. The Plasma State. San Diego, CA: Academic Press Inc., 1971. ISBN: 9780126405507. 4. Hazeltine, R. D., and F. L. Waelbroeck. The Framework of Plasma Physics. Boulder, CO: Westview Press, 2004. ISBN: 9780813342139. 5. Huddlestone, R. H., and S. L. Leonard. Plasma Diagnostic Techniques. San Diego, CA: Academic Press, 1965
WEB SOURCES	<ol style="list-style-type: none"> 1. https://fusedweb.llnl.gov/Glossary/glossary.html 2. http://farside.ph.utexas.edu/teaching/plasma/lectures1/index.html 3. http://www.plasmas.org/ 4. http://www.phy6.org/Education/whplasma.html 5. http://www.plasmas.org/resources.htm

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Understand the collision, cross section of charged particles and to able to correlate the magnetic effect of ion and electrons in plasma state.	K1, K2
CO2	Understand the plasma and learn the magneto-hydrodynamics concepts applied to plasma.	K2
CO3	Explore the oscillations and waves of charged particles and thereby apply the Maxwell's equation to quantitative analysis of plasma.	K1, K3
CO4	Analyze the different principle and techniques to diagnostics of plasma.	K2, K5
CO5	Learn the possible applications of plasma by incorporating various electrical and electronic instruments.	K4
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	1	2	1	2	3	3
CO2	3	3	2	1	1	2	1	2	3	3
CO3	3	3	2	2	1	2	1	3	3	3
CO4	3	3	3	2	1	2	1	3	3	3
CO5	3	3	3	2	1	2	1	3	3	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	1	1	2	1	2	3	3
CO2	3	3	2	1	1	2	1	2	3	3
CO3	3	3	2	2	1	2	1	3	3	3
CO4	3	3	3	2	1	2	1	3	3	3
CO5	3	3	3	2	1	2	1	3	3	3

Elective - List 2 – 10. BIO PHYSICS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	BIO PHYSICS	ELECTIVE				3	4	75

Pre-Requisites

Fundamental concepts of Physics and Biology

Learning Objectives

- To understand the physical principles involved in cell function maintenance.
- To understand the fundamentals of macromolecular structures involved in propagation of life.
- To understand the biophysical function of membrane and neuron.
- To understand various kinds of radiation and their effects on living system and to know the hazards posed by such radiations and the required precautions.
- To understand the physical principles behind the various techniques available for interrogating biological macromolecules.

UNITS	Course Details
UNIT I: CELLULAR BIOPHYSICS	Architecture and Life Cycle of cells – Organelles of Prokaryotic and Eukaryotic cell – Cell size and shape – Fine structure of Prokaryotic and Eukaryotic cell organization – Compartment & assemblies membrane system – Extracellular matrix - Molecular mechanisms of Vesicular traffic - Electrical activities of cardiac and neuronal cells.
UNIT II: MOLECULAR BIOPHYSICS	Macromolecular structure: Protein structure – amino acids, peptide bonds, primary, secondary, tertiary and quaternary structures of proteins Nucleic acid structure: nucleosides and nucleotides, RNA structure, DNA structure and conformation. Special Bio-macromolecules: Metalloproteins, nucleoproteins, ribozymes, chaperons and prions.
UNIT III: MEMBRANE AND NEURO BIOPHYSICS	Models membranes - Biological membranes and dynamics – Membrane Capacitors – Transport across cell and organelle membranes – Ion channels. Nervous system: Organization of the nervous system – Membrane potential – Origins of membrane potential - Electrochemical potentials – Nernst equation – Goldman equation.
UNIT IV: RADIATION BIO PHYSICS	X-Ray: Effects on bio-macromolecules – Gamma Radiation: Molecular effects of gamma radiation, Radiation effects on nucleic acids and membranes, Effects on cell and organelles – UV radiation: Effects on bio-macromolecules and proteins – Radiation hazards and protection – use of radiations in cancer.

UNIT V: PHYSICAL METHODS IN BIOLOGY	Spectroscopy: UV-Visible absorption spectrophotometry – Optical Rotatory Dispersion (ORD) – Structure Determination: X-ray Crystallography, Electron spin resonance (ESR) and biological applications. Chromatography: Thin layer chromatography (TLC), Gas liquid chromatography (GLC) – Centrifugation: Differential centrifugation, density gradient centrifugation. Electrophoresis: Gel electrophoresis, polyacrylamide gel electrophoresis.
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. The cell: A molecular approach, Geoffrey M. Cooper, ASM Press, 2013. 2. Biophysics, VasanthaPattabhi, N. Gautham, Narosa Publishing, 2009 3. Biophysics, P. S. Mishra VK Enterprises, 2010. 4. Biophysics, M. A Subramanian, MJP Publishers, 2005. 5. Bioinstrumentation, L. Veerakumari, MJP Publishers, 2006.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Chemical Biophysics by Daniel A Beard (Cambridge University Press, 2008). 2. Essential cell biology by Bruce Albert et al (Garland Science) 3. Biophysics, W. Hoppe, W. Lohmann, H. Markl and H. Ziegler. Springer Verlag, Berlin (1983). 4. Membrane Biophysics by Mohammad Ashrafuzzaman, Jack A. Tuszyński, (Springer science & business media). 5. Biological spectroscopy by Iain D. Campbell, Raymond A. Dwek
WEB SOURCES	<ol style="list-style-type: none"> 1. General Bio: http://www.biology.arizona.edu/DEFAULT.html 2. Spectroscopy: http://www.cis.rit.edu/htbooks/nmr/inside.htm 3. Electrophoresis: http://learn.genetics.utah.edu/content/labs/gel/ 4. Online biophysics programs: http://mw.concord.org/modeler/ 5. https://blanco.biomol.uci.edu/WWWResources.html

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Understand the structural organization and function of living cells and should be able to apply the cell signaling mechanism and its electrical activities.	K2, K3
CO2	Comprehension of the role of biomolecular conformation to function.	K1
CO3	Conceptual understanding of the function of biological membranes and also to understand the functioning of nervous system.	K2, K5
CO4	To know the effects of various radiations on living systems and how to prevent ill effects of radiations.	K1, K5
CO5	Analyze and interpret data from various techniques viz., spectroscopy, crystallography, chromatography etc.,	K4
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	1	2	1	3	3	2
CO2	3	3	3	2	1	2	1	3	3	2
CO3	3	3	3	3	1	1	2	3	3	2
CO4	3	3	3	2	1	1	2	3	3	3
CO5	3	3	3	3	1	1	2	3	3	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	1	2	1	3	3	2
CO2	3	3	3	2	1	2	1	3	3	2
CO3	3	3	3	3	1	1	2	3	3	2
CO4	3	3	3	2	1	1	2	3	3	3
CO5	3	3	3	3	1	1	2	3	3	3

Elective List 2 – 11. NONLINEAR DYNAMICS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	NONLINEAR DYNAMICS	ELECTIVE				3	4	75

Pre-Requisites

Basics of Numerical methods and Differential equations, Fundamentals of linear and nonlinear waves, and Basics of communication systems

Learning Objectives

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|--|
| <ul style="list-style-type: none"> ➤ To school the students about the analytical and numerical techniques of nonlinear dynamics. ➤ To make the students understand the concepts of various coherent structures. ➤ To train the students on bifurcations and onset of chaos. ➤ To educate the students about the theory of chaos and its characterization. ➤ To make the students aware of the applications of solitons, chaos and fractals. |
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UNITS	Course Details
UNIT I: GENERAL	Linear waves-ordinary differential equations(ODEs)-Partial differential equations(PDEs)- Methods to solve ODEs and PDEs.- Numerical methods – Linear and Nonlinear oscillators-Nonlinear waves-Qualitative features
UNIT II: COHERENT STRUCTURES	Linear and Nonlinear dispersive waves - Solitons – KdB equation – Basic theory of KdB equation –Ubiquitous soliton equations – AKNS Method, Backlund transformation, Hirotabilinearization method, Painleve analysis - Perturbation methods- Solitons in Optical fibres - Applications.
UNIT III: BIFURCATIONS AND ONSET OF CHAOS	One dimensional flows – Two dimensional flows – Phase plane – Limit cycles – Simple bifurcations – Discrete Dynamical system – Strange attractors – Routes to chaos.
UNIT IV: DUFFING OSCILLATOR AND FRACTALS	Bifurcation scenario in Duffing Oscillator-Period doubling route to chaos-Intermittency transition-Fractals-Fractal dimension-Properties of fractal-Construction and properties of middle third cantor set and Koch curve-Application of fractals.
UNIT V APPLICATIONS	Soliton based communication systems – Soliton based computation – Synchronization of chaos – Chaos based communication – Cryptography – Image processing – Stochastic – Resonance – Chaos based computation – Time Series analysis.
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. M.Lakshmanan and S.Rajasekar, Nonlinear Dynamics: Integrability, Chaos and Patterns. Springer, 2003. 2. A.Hasegawa and Y.Kodama, Solitons in Optical Communications. Oxford Press, 1995. 3. Drazin, P. G. Nonlinear Systems. Cambridge University Press, 2012. ISBN: 9781139172455. 4. Wiggins, S. Introduction to Applied Nonlinear Dynamical Systems and Chaos. Springer, 2003. ISBN: 9780387001777. 5. Strogatz, Steven H. Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering. Westview Press, 2014. ISBN: 9780813349107.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. G.Drazin and R.S.Johnson. Solitons: An Introduction. Cambridge University Press, 1989. 2. M.Lakshmanan and K.Murali. Chaos in Nonlinear Oscillators. World Scientific, 1989. 3. S.Strogatz. Nonlinear Dynamics and Chaos. Addison Wesley, 1995. 4. Hao Bai-Lin, Chaos (World Scientific, Singapore, 1984). 5. Kahn, P. B., Mathematical Methods for Scientists & Engineers (Wiley, NY, 1990)
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.digimat.in/nptel/courses/video/108106135/L06.html 2. http://digimat.in/nptel/courses/video/115105124/L01.html 3. https://www.digimat.in/nptel/courses/video/108106135/L01.html 4. http://complex.gmu.edu/neural/index.html 5. https://cnls.lanl.gov/External/Kac.php

Elective - List 2 – 12. QUANTUM FIELD THEORY	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	QUANTUM FIELD THEORY	ELECTIVE				3	4	75

Pre-Requisites

Prior exposure on fundamentals of Quantum mechanics and Special Relativity will be essential.

Learning Objectives

- To school the students about the analytical and numerical techniques of nonlinear dynamics.
- To make the students understand the concepts of various coherent structures.
- To train the students on bifurcations and onset of chaos.
- To educate the students about the theory of chaos and its characterization.
- To make the students aware of the applications of solitons, chaos and fractals.

UNITS	Course Details
UNIT I: SYMMETRY PRINCIPLES	Relativistic kinematics, relativistic waves, Klein-Gordon (KG) equation as a relativistic wave equation, treatment of the KG equation as a classical wave equation: its Lagrangian and Hamiltonian, Noether's theorem and derivation of energy-momentum and angular momentum tensors as consequence of Poincaré symmetry, internal symmetry and the associated conserved current.
UNIT II: QUANTIZATION OF KLEIN-GORDAN FIELD	Canonical quantization of the KG field, solution of KG theory in Schrödinger and Heisenberg pictures, expansion in terms of creation and annihilation operators, definition of the vacuum and N-particle eigenstates of the Hamiltonian, vacuum expectation values, propagators, spin and statistics of the KG quantum.
UNIT III: QUANTIZATION OF DIRAC FIELD	Review of Dirac equation and its quantization, use of anti-commutators, creation and destruction operators of particles and antiparticles, Dirac propagator, energy, momentum and angular momentum, spin and statistics of Dirac quanta.
UNIT IV: QUANTIZATION OF ELECTROMAGNETIC FIELDS	Review of free Maxwell's equations, Lagrangian, gauge transformation and gauge fixing, Hamiltonian, quantization in terms of transverse delta functions, expansion in terms of creation operators, spin, statistics and propagator of the photon.

<p style="text-align: center;">UNIT V: PERTURBATIVE INTERACTION AT TREE LEVEL</p>	<p>Introduction to interacting quantum fields, Wick's Theorem, Feynman Diagram, Examples from quantum electrodynamics at the tree level: positron-electron and electron-electron scattering.</p>
<p style="text-align: center;">UNIT VI: PROFESSIONAL COMPONENTS</p>	<p>Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism</p>
<p style="text-align: center;">TEXT BOOKS</p>	<ol style="list-style-type: none"> 1. J. D. Bjorken and S. D. Drell, <i>Relativistic Quantum Fields</i> David 2. An Introduction to Quantum Field Theory by M. Peskin and D. V. Schroeder 3. Quantum Field theory: From Operators to Path Integrals, 2nd edition by Kerson Huang 4. Quantum Field Theory by Mark Srednicki 5. Quantum Field Theory by Claude Itzykson and Jean Bernard Zuber.
<p style="text-align: center;">REFERENCE BOOKS</p>	<ol style="list-style-type: none"> 1. V.B. Berestetskii, E.M. Lifshitz and L.P. Pitaevskii, <i>Quantum Electrodynamics</i> 2. Introduction to the Theory of Quantized Fields by N. N. Bogoliubov and D. V. Shirkov (1959) 3. Quantum Field Theory by L. H. Ryder (1984) 4. Quantum Field Theory by L. S. Brown (1992) 5. Quantum Field Theory: A Modern Introduction by M. Kaku (1993)
<p style="text-align: center;">WEB SOURCES</p>	<ol style="list-style-type: none"> 1. https://homepages.dias.ie/ydri/QFTNOTES4v2.pdf 2. https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/reference-spapers.aspx?referenceid=2605249 3. https://archive.nptel.ac.in/courses/115/106/115106065/ 4. http://www.nhn.ou.edu/~milton/p6433/p6433.html 5. https://plato.stanford.edu/entries/quantum-field-theory/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Understand the interconnection of Quantum Mechanics and Special Relativity	K1
CO2	Enable the students to understand the method of quantization to various field	K2
CO3	Employ the creation and annihilation operators for quantization	K5
CO4	Summarizes the interacting field, in quantum domain, and gives a discussion on how perturbation theory is used here.	K1, K3
CO5	Understand the concept of Feynman diagram	K2
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	3	2	3	3	2	3
CO2	3	3	3	2	3	3	3	3	2	3
CO3	3	3	3	2	3	2	3	3	2	3
CO4	3	3	3	2	3	3	3	3	2	3
CO5	3	3	3	2	3	3	3	3	2	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	3	2	3	3	2	3
CO2	3	3	3	2	3	3	3	3	2	3
CO3	3	3	3	2	3	2	3	3	2	3
CO4	3	3	3	2	3	3	3	3	2	3
CO5	3	3	3	2	3	3	3	3	2	3

Elective - List 2 – 13. GENERAL RELATIVITY AND COSMOLOGY	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	GENERAL RELATIVITY AND COSMOLOGY	ELECTIVE				3	4	75

Pre-Requisites
Skill in mathematics and mechanics
Learning Objectives
➤ To give an introduction to students in the areas of general relativity and cosmology

UNITS	Course Details
UNIT I: TENSORS	Tensors in index notation - Kronecker and Levi Civita tensors - inner and outer products - contraction - symmetric and antisymmetric tensors - quotient law - metric tensors - covariant and contravariant tensors - vectors - the tangent space - dual vectors - tensors - tensor products - the Levi-Civita tensor - tensors in Riemann spaces
UNIT I: TENSORS FIELD	Vector-fields, tensor-fields, transformation of tensors - gradient and Laplace operator in general coordinates - covariant derivatives and Christoffel connection - Elasticity: Field tensor - field energy tensor - strain tensor - tensor of elasticity- curvature tensor
UNIT III: GENERAL RELATIVITY	The spacetime interval - the metric - Lorentz transformations - space-time diagrams - world-lines - proper time - energy-momentum vector - energy-momentum tensor - perfect fluids - energy-momentum conservation - parallel transport - the parallel propagator - geodesics - affine parameters - the Riemann curvature tensor - symmetries of the Riemann tensor - the Bianchi identity
UNIT IV: TENSOR IN RELATIVITY	Ricci and Einstein tensors - Weyl tensor - Killing vectors - the Principle of Equivalence - gravitational redshift - gravitation as space-time curvature - the Newtonian limit - physics in curved space-time - Einstein's equations - the Weak Energy Condition - causality - spherical symmetry - the Schwarzschild metric - perihelion precession
UNIT V: COSMOLOGY	Expansion of the Universe - thermal history - and the standard cosmological model - Friedmann - Robertson-Walker type models of the Universe - Primordial inflation and the theory of cosmological fluctuations - Theory and observations of the cosmic microwave background and of the large-scale structure of the Universe - Dark matter and dark energy - theoretical questions and observational evidence - inflation - origin of galaxies and other open problems

UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
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TEXT BOOKS	<ol style="list-style-type: none"> 1. M. R. Spiegel, <i>Vector Analysis, Schaum's outline series</i>, McGraw Hill, New York, 1974. 2. James Hartle, <i>Gravity: An introduction to Einstein's general relativity</i>, San Francisco, Addison-Wesley, 2002 3. Sean Carroll, <i>Spacetime and Geometry: An Introduction to General Relativity</i>, (Addison-Wesley, 2004). 4. Jerzy Plebanski and Andrzej Krasinski, <i>An Introduction to General Relativity and Cosmology</i>, Cambridge University Press 2006 5. Meisner, Thorne and Wheeler: <i>Gravitation</i> W. H. Freeman & Co., San Francisco 1973
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Robert M. Wald: <i>Space, Time, and Gravity: the Theory of the Big Bang and Black Holes</i>, Univ. of Chicago Press. 2. J. V. Narlikar, <i>Introduction to Cosmology</i>, Jones & Bartlett 1983 3. Steven Weinberg, <i>Gravitation and Cosmology</i>, New York, Wiley, 1972. 4. Jerzy Plebanski and Andrzej Krasinski, <i>An Introduction to General Relativity and Cosmology</i>, Cambridge University Press 2006 5. R Adler, M Bazin & M Schiffer, <i>Introduction to General Relativity</i>
WEB SOURCES	<ol style="list-style-type: none"> 1. http://www.fulviofrisone.com/attachments/article/486/A%20First%20Course%20In%20General%20Relativity%20-%20Bernard%20F.Schutz.pdf 2. https://link.springer.com/book/9780387406282 3. https://ocw.mit.edu/courses/8-962-general-relativity-spring-2020/resources/lecture-18-cosmology-i/ 4. https://arxiv.org/abs/1806.10122 5. https://uwaterloo.ca/applied-mathematics/future-undergraduates/what-you-can-learn-applied-mathematics/relativity-and-cosmology

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Skillfully handle tensors	K1
CO2	Understanding of the underlying theoretical aspects of general relativity and cosmology	K2
CO3	Gain knowledge on space time curvature	K1
CO4	Equipped to take up research in cosmology	K3, K4
CO5	Confidently solve problems using mathematical skills	K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	1	3	2	3	2	2	2	2
CO2	3	3	1	3	2	3	2	2	2	2
CO3	3	2	1	2	1	2	1	1	3	2
CO4	3	2	1	2	1	2	1	1	3	2
CO5	3	2	1	2	1	2	1	1	3	2

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	1	3	2	3	2	2	2	2
CO2	3	3	1	3	2	3	2	2	2	2
CO3	3	2	1	2	1	2	1	1	3	2
CO4	3	2	1	2	1	2	1	1	3	2
CO5	3	2	1	2	1	2	1	1	3	2

Elective - List 2 – 14. ADVANCED OPTICS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	ADVANCED OPTICS	ELECTIVE				3	4	75

Pre-Requisites
Knowledge of ray properties and wave nature of light
Learning Objectives
<ul style="list-style-type: none"> ➤ To know the concepts behind polarization and could pursue research work on application aspects of laser ➤ To impart an extensive understanding of fiber and non-linear optics ➤ To study the working of different types of LASERS ➤ To differentiate first and second harmonic generation ➤ Learn the principles of magneto-optic and electro-optic effects and its applications

UNITS	Course Details
UNIT 1: POLARIZATION AND DOUBLE REFRACTION	Classification of polarization – Transverse character of light waves – Polarizer and analyzer – Malu’s law – Production of polarized light – Wire grid polarizer and the polaroid – Polarization by reflection – Polarization by double refraction – Polarization by scattering – The phenomenon of double refraction – Normal and oblique incidence – Interference of polarized light: Quarter and half wave plates – Analysis of polarized light – Optical activity
UNIT II: LASERS	Basic principles – Spontaneous and stimulated emissions – Components of the laser – Resonator and lasing action – Types of lasers and its applications – Solid state lasers – Ruby laser – Nd:YAG laser – gas lasers – He-Ne laser – CO ₂ laser – Chemical lasers – HCl laser – Semiconductor laser
UNIT III: FIBER OPTICS	Introduction – Total internal reflection – The optical fiber – Glass fibers – The coherent bundle – The numerical aperture – Attenuation in optical fibers – Single and multi-mode fibers – Pulse dispersion in multimode optical fibers – Ray dispersion in multimode step index fibers – Parabolic-index fibers – Fiber-optic sensors: precision displacement sensor – Precision vibration sensor
UNIT IV: NON-LINEAR OPTICS	Basic principles – Harmonic generation – Second harmonic generation – Phase matching – Third harmonic generation – Optical mixing – Parametric generation of light – Self-focusing of light

UNIT V: MAGNETO- OPTICS AND ELECTRO-OPTICS	Magneto-optical effects – Zeeman effect – Inverse Zeeman effect – Faraday effect – Voigt effect – Cotton-mouton effect – Kerr magneto-optic effect – Electro-optical effects – Stark effect – Inverse stark effect – Electric double refraction – Kerr electro-optic effect – Pockels electro-optic effect
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. B. B. Laud, 2017, Lasers and Non – Linear Optics, 3rd Edition, New Age International (P) Ltd. 2. AjoyGhatak, 2017, Optics, 6th Edition, McGraw – Hill Education Pvt. Ltd. 3. William T. Silfvast, 1996, Laser Fundamentals Cambridge University Press, New York 4. J. Peatros, Physics of Light and Optics, a good (and free!) electronic book 5. B. Saleh, and M. Teich, Fundamentals of Photonics, Wiley-Interscience,
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. F. S. Jenkins and H. E. White, 1981, Fundamentals of Optics, (4th Edition), McGraw – Hill International Edition. 2. Dieter Meschede, 2004, Optics, Light and Lasers, Wiley – VCH, Varley GmbH. 3. Lipson, S. G. Lipson and H. Lipson, 2011, Optical Physics, 4th Edition, Cambridge University Press, New Delhi, 2011. 4. Y. B. Band, Light and Matter, Wiley and Sons (2006) 5. R. Guenther, Modern Optics, Wiley and Sons (1990)
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=WgzynecPiyc 2. https://www.youtube.com/watch?v=ShQWwobpW60 3. https://www.ukessays.com/essays/physics/fiber-optics-and-it-applications.php 4. https://www.youtube.com/watch?v=0kEvr4DKGRI 5. http://optics.byu.edu/textbook.aspx

Elective - List 2 – 15. ADVANCEDMATHEMATICAL PHYSICS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	ADVANCEDMATHEMATICAL PHYSICS	ELECTIVE				3	4	75

Pre-Requisites

Good knowledge in basic mathematics

Learning Objectives

- To educate and involve students in the higher level of mathematics and mathematical methods relevant and applicable to Physics.

UNITS	Course Details
UNIT I: DISCRETE GROUPS	Definition of a group, subgroup, class, Lagrange's theorem, invariant subgroup, Homomorphism and isomorphism between two groups. Representation of a group, unitary representations, reducible and irreducible representations Schur's lemmas, orthogonality theorem, character table, reduction of Kronecker product of representations, criterion for irreducibility of a representation.
UNIT II: CONTINUOUS GROUPS	Infinitesimal generators, Lie algebra; Rotation group, representations of the Lie algebra of the rotation group, representation of the rotation group, D-matrices and their basic properties. Addition of two angular momenta and C.G. coefficients, Wigner-Eckart theorem.
UNIT III: SPECIAL UNITARY GROUPS	Definition of unitary, unimodular groups SU(2) and SU(3). Lie algebra of SU(2). Relation between SU(2) and rotation group. Lie algebra of SU(3)-Gellmann's matrices. Cartan form of the SU(3). Lie algebra, roots and root diagram for SU(3). Weights and their properties, weight diagrams for the irreducible representations 3, 3*, 6, 6, 8, 10 and 10 of SU(3). Direct product of two SU(3) representations, Young tableaux method of decomposition of products of IR's illustrations with the representations of dim<10. C.G.coefficients for 3 x 3* and 3 x 6 representations. SU(3) symmetry in elementary particle physics, quantum numbers of hadrons and SU(2) and SU(3) classification of hadrons.
UNIT IV: TENSORS	Cartesian vectors and tensors illustration with moment of inertia, conductivity, dielectric tensors. Four vector in special relativity, vectors and tensors under Lorentz transformations, Illustration from physics. Vectors and tensors under general co-ordinate transformations, contravariant and covariant vectors and tensors, mixed tensors; tensor algebra, addition, subtraction, direct product of tensors, quotient theorem, symmetric and antisymmetric tensors.
UNIT V: TENSOR CALCULUS	Parallel transport, covariant derivative, affine connection. Metric tensor. Expression for Christoffel symbols in terms of and its derivatives (assuming $Dg = 0$). Curvature tensor, Ricci tensor and Einstein tensor. Bianchi identities, Schwarzschild solution to the Einstein equation $G=0$.

UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. A.W.Joshi, Group Theory for Physicists 2. D.B.Lichtenberg, Unitary Symmetry and Elementary Particles 3. E.Butkov, Mathematical Physics 4. J.V.Narlikar, General Relativity & Cosmology 5. R. Geroch, Mathematical Physics, The University of Chicago press (1985).
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. M.Hamermesh <i>Group Theory</i> 2. M.E.Rose: Elementary Theory of Angular Momentum 3. Georgi : Lie Groups for Physicists 4. E.A.Lord: Tensors, Relativity & Cosmology 5. P. Szekeres, A course in modern mathematical physics: Groups, Hilbert spaces and differential geometry, Cambridge University Press.
WEB SOURCES	<ol style="list-style-type: none"> 1. https://vdoc.pub/documents/unitary-symmetry-and-elementary-particles-c4qsfejthkc0 2. https://physics.iith.ac.in/HEP_Physics/slides/poplawskitalk.pdf 3. https://www.hindawi.com/journals/amp/ 4. https://projecteuclid.org/journals/advances-in-theoretical-and-mathematical-physics 5. https://www.springer.com/journal/11232

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Gained knowledge of both discrete and continuous groups	K1
CO2	Apply various important theorems in group theory	K3
CO3	Construct group multiplication table, character table relevant to important branches of physics.	K5
CO4	Equipped to solve problems in tensors	K4, K5
CO5	Developed skills to apply group theory and tensors to peruse research	K2, K3
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	1	2	1	2	3	3
CO2	3	3	2	1	1	1	1	2	3	2
CO3	3	3	2	1	2	2	1	2	3	2
CO4	3	3	2	2	1	2	1	2	3	2
CO5	3	3	2	2	2	1	1	2	3	2

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	2	1	1	2	1	2	3	3
CO2	3	3	2	1	1	1	1	2	3	2
CO3	3	3	2	1	2	2	1	2	3	2
CO4	3	3	2	2	1	2	1	2	3	2
CO5	3	3	2	2	2	1	1	2	3	2

Elective - List 3 – 16. ADVANCED SPECTROSCOPY	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	ADVANCED SPECTROSCOPY	ELECTIVE				3	4	75

Pre-Requisites

Basic knowledge of group theory, abstract thinking ability, lasers, chemical bonds and molecular structures

Learning Objectives

- Helps students understand and appreciate spectroscopy as a sufficiently broad field in which many sub disciplines exist.
- Make them appreciate each of these specific techniques with numerous implementations.
- To realize the progress in this field that is rapid, resulting in improved instrument capabilities and an ever-widening range of applications.
- To apply group theory in spectroscopy to shed light on molecular symmetry and determine important physical parameters.

UNITS	CourseDetails
UNITI: MOLECULAR SPECTROSCOPY AND GROUP THEORY	Group axioms –subgroup, simple group, Abelian group, cyclic group, order of a group, class- Lagrange's theorem statement and proof - Symmetry operations and symmetry elements - Application: construction of group multiplication table (not character table) for groups of order 2, 3, cyclic group of order 4, noncyclic group of order 4 – reducible and irreducible representations- Unitary representations – Schur's lemmas – Great orthogonality theorem - point group -Simple applications : Symmetry operations of water and ammonia- Construction of character table for C_{2v} (water) and C_{3v} (ammonia) molecules
UNITII: LASER SPECTROSCOPY	Lasers as Spectroscopy Light sources – Special Characteristics of Laser emission- ultra short pulses- laser cooling -Single and multi-mode lasers- Laser tenability- Fluorescence spectroscopy with lasers- Laser Raman Spectroscopy – Non-linear Spectroscopy – Applications of Laser Spectroscopy in medical fields, materials science research
UNITIII: MOSSBAUER SPECTROSCOPY	Basic idea of Mossbauer spectroscopy - Principle- Mossbauer effect- Recoilless emission and absorption- Chemical shift -Effect of electric and magnetic fields – hyperfine interactions- instrumentation-Applications: understanding molecular and electronic structures
UNITIV: XRAY PHOTOELECTRON SPECTROSCOPY	Principle – XPS spectra and its interpretation- ECSA-EDAX- other forms of XPS – chemical shift - Applications : - stoichiometric analysis- electronic structure- XPES techniques used in astronomy, glass industries, paints and in biological research

UNIT V: MOLECULAR MODELLING	Determination of force constants- force field from spectroscopic data- normal coordinate analysis of a simple molecule (H ₂ O) – analyzing thermodynamic functions, partition functions, enthalpy, specific heat and related parameters from spectroscopic data- molecular modelling using data from various spectroscopic studies
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. William Kemp, 2019, Organic Spectroscopy (2nd Edition) MacMillan, Indian Edition. 2. C N Banwell and McCash, 1994, Fundamentals of Molecular Spectroscopy, 4th Edition, Tata McGraw–Hill, New Delhi. 3. D.N. Satyanarayana, 2001, <i>Vibrational Spectroscopy and Applications</i>, New Age International Publication. 4. B.K. Sharma , 2015, <i>Spectroscopy</i>, Goel Publishing House Meerut. 5. J M Hollas, 2002, Basic Atomic and Molecular Spectroscopy, Royal Society of Chemistry, RSC, Cambridge.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Demtroder. W, Laser Spectroscopy: Basic concepts and Instrumentation, SpringerLink. 2. B. P. Straughan and S. Walker, 1976, Spectroscopy Vol.I., Chapman and Hall, New York. 3. J L McHale, 2008, Molecular Spectroscopy, Pearson Education India, New Delhi. 4. David. L. Andrews, Introduction to Laser Spectroscopy, Springer, 2020 5. Kalsi.P.S, 2016, Spectroscopy of Organic Compounds (7th Edition) New Age International Publishers.
WEB SOURCES	<ol style="list-style-type: none"> 1. Fundamentals of Spectroscopy - Course (nptel.ac.in) 2. http://mpbou.edu.in/slm/mscche1p4.pdf 3. https://onlinecourses.nptel.ac.in/noc20_cy08/preview 4. https://www.coursera.org/lecture/spectroscopy/nmr-spectroscopy-introduction-XCWRu 5. https://serc.carleton.edu/research_education/geochemsheets/techniques/mossbauer.html

Elective - List 3 – 17. MICROPROCESSOR 8085 AND MICROCONTROLLER 8051	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	MICROPROCESSOR 8085 AND MICROCONTROLLER 8051	ELECTIVE				3	4	75

Pre-Requisites

Knowledge of number systems and binary operations

Learning Objectives

- To provide an understanding of the architecture and functioning of microprocessor 8085A and to the methods of interfacing I/O devices and memory to microprocessor
- To introduce 8085A programming and applications and the architecture and instruction sets of microcontroller 8051

UNITS	Course Details
UNIT I:8085 PROGRAMMING, PERIPHERAL DEVICES AND THEIR INTERFACING	Instruction set - Addressing modes - Programming techniques - Memory mapped I/O scheme- I/O mapped I/O scheme - Memory and I/O interfacing- Data transfer schemes - Interrupts of 8085 - Programmable peripheral interface (PPI) - Control group and control word- Programmable DMA controller - Programmable interrupt controller – Programmable communication interface - Programmable counter /interval timer.
UNIT II: 8085 INTERFACING APPLICATIONS	Seven segment display interface - Interfacing of Digital to Analog converter and Analog to Digital converter - Stepper motor interface - Measurement of electrical quantities –Voltage and current) Measurement of physical quantities (Temperature an strain).
UNIT III: 8051 MICROCONTROLLERHARDWARE	Introduction – Features of 8051 – 8051 Microcontroller Hardware: Pin-out 8051, Central Processing Unit (CPU), internal RAM, Internal ROM, Register set of 8051 – Memory organization of 8051 – Input/Output pins, Ports and Circuits – External data memory and program memory: External program memory, External data memory.
UNIT IV: 8051 INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING	Addressing modes – Data moving (Data transfer) instructions: Instructions to Access external data memory, external ROM / program memory, PUSH and POP instructions, Data exchange instructions – Logical instructions: byte and bit level logical operations, Rotate and swap operations – Arithmetic instructions: Flags, Incrementing and decrementing, Addition, Subtraction, Multiplication and division, Decimal arithmetic –

	Jump and CALL instructions: Jump and Call program range, Jump, Call and subroutines – Programming.
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UNIT V: INTERRUPT PROGRAMMING AND INTERFACING TO EXTERNAL WORLD	8051 Interrupts – Interrupt vector table – Enabling and disabling an interrupt – Timer interrupts and programming – Programming external hardware interrupts – Serial communication interrupts and programming – Interrupt priority in the 8051 : Nested interrupts , Software triggering of interrupt. LED Interface Seven segment display interface- Interfacing of Digital to Analog converter and Analog to Digital converter - Stepper motor interface - Measurement of electrical quantities – Voltage and current) Measurement of physical quantities(Temperature an strain).
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. A. NagoorKani, Microprocessors & Microcontrollers, RBA Publications (2009). 2. A. P. Godse and D. A. Godse, Microprocessors, Technical Publications, Pune (2009). 3. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram International Publishing (2013). 4. B. Ram, Fundamentals of Microprocessors & Microcontrollers, DhanpatRai publications New Delhi (2016). 5. V. Vijayendran, 2005, Fundamentals of Microprocessor-8085”, 3rd Edition S.Visvanathan Pvt, Ltd.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Douglas V. Hall, Microprocessors and Interfacing programming and Hardware, Tata Mc Graw Hill Publications (2008) 2. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. Mckinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education (2008). 3. Barry B. Brey, 1995, The Intel Microprocessors 8086/8088, 80186, 80286, 80386 and 80486, 3rd Edition, Prentice- Hall of India, New Delhi. 4. J. Uffrenbeck, “The 8086/8088 Family-Design, Programming and Interfacing, Software, Hardware and Applications”, Prentice-Hall of India, New Delhi. 5. W. A. Tribel, Avtar Singh, “The 8086/8088 Microprocessors: Programming, Interfacing, Software, Hardware and Applications”, Prentice-Hall of India, New Delhi.

WEB SOURCE S	<ol style="list-style-type: none"> https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.html http://www.electronicengineering.nbcafe.in/peripheral-mapped-io-interfacing/ https://www.geeksforgeeks.org/programmable-peripheral-interface-8255/ http://www.circuitstoday.com/8051-microcontroller https://www.elprocus.com/8051-assembly-language-programming/
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COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Gain knowledge of architecture and working of 8085 microprocessor.	K1
CO2	Get knowledge of architecture and working of 8051 Microcontroller.	K1
CO3	Be able to write simple assembly language programs for 8085A microprocessor.	K2, K3
CO4	Able to write simple assembly language programs for 8051 Microcontroller.	K3, K4
CO5	Understand the different applications of microprocessor and microcontroller.	K3, K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	3	3	3	1	1	1	1	1
CO2	2	1	1	1	1	1	1	1	1	1
CO3	3	3	3	3	3	1	1	1	1	1
CO4	3	3	3	3	3	1	1	1	1	1
CO5	3	3	3	3	3	1	1	1	1	1

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	3	3	3	3	1	1	1	1	1
CO2	2	1	1	1	1	1	1	1	1	1
CO3	3	3	3	3	3	1	1	1	1	1
CO4	3	3	3	3	3	1	1	1	1	1
CO5	3	3	3	3	3	1	1	1	1	1

Elective - List 3 – 18.CHARACTERIZATION OF MATERIALS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	CHARACTERIZATION OF MATERIALS	ELECTIVE				3	4	75

Pre-Requisites

Fundamentals of Heat and Thermodynamics, Basics of Optical systems, Microscopic systems, Electrical measurements and Fundamentals of Spectroscopy.

Learning Objectives

- To make the students learn some important thermal analysis techniques namely TGA, DTA, DSC and TMA.
- To make the students understand the theory of image formation in an optical microscope and to introduce other specialized microscopic techniques.
- To make the students learn and understand the principle of working of electron microscopes and scanning probe microscopes.
- To make the students understand some important electrical and optical characterization techniques for semiconducting materials.
- To introduce the students the basics of x-ray diffraction techniques and some important spectroscopic techniques.

UNITS	Course details
UNIT I THERMAL ANALYSIS	Introduction – thermogravimetric analysis (TGA) – instrumentation – determination of weight loss and decomposition products – differential thermal analysis (DTA)- cooling curves – differential scanning calorimetry (DSC) – instrumentation – specific heat capacity measurements – determination of thermomechanical parameters.
UNIT II MICROSCOPIC METHODS	Optical Microscopy: optical microscopy techniques – Bright field optical microscopy – Dark field optical microscopy – Dispersion staining microscopy - phase contrast microscopy –differential interference contrast microscopy - fluorescence microscopy - confocal microscopy - - digital holographic microscopy - oil immersion objectives - quantitative metallography - image analyzer.
UNIT III ELECTRON MICROSCOPY AND SCANNING PROBE MICROSCOPY	SEM, EDAX, EPMA, TEM: working principle and Instrumentation – sample preparation –Data collection, processing and analysis- Scanning tunneling microscopy (STEM) - Atomic force microscopy (AFM) - Scanning new field optical microscopy.

UNIT IV ELECTRICAL METHODS AND	Two probe and four probe methods- van der Pauw method – Hall probe and measurement – scattering mechanism – C-V characteristics – Schottky barrier capacitance – impurity
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OPTICAL CHARACTERISATION	concentration – electrochemical C-V profiling – limitations. Photoluminescence – light – matter interaction – instrumentation – electroluminescence – instrumentation – Applications.
UNIT V X-RAY AND SPECTROSCOPIC METHODS	Principles and instrumentation for UV-Vis-IR, FTIR spectroscopy, Raman spectroscopy, ESR, NMR, NQR, XPS, AES and SIMS-proton induced X-ray Emission spectroscopy (PIXE) –Rutherford Back Scattering (RBS) analysis-application - Powder diffraction - Powder diffractometer -interpretation of diffraction patterns - indexing - phase identification - residual stress analysis - Particle size, texture studies - X-ray fluorescence spectroscopy - uses.
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. R. A. Stradling and P. C. Klipstain. Growth and Characterization of semiconductors. Adam Hilger, Bristol, 1990. 2. J. A. Belk. Electron microscopy and microanalysis of crystalline materials. Applied Science Publishers, London, 1979. 3. Lawrence E. Murr. Electron and Ion microscopy and Microanalysis principles and Applications. Marcel Dekker Inc., New York, 1991 4. D. Kealey and P. J. Haines. Analytical Chemistry. Viva Books Private Limited, New Delhi, 2002. 5. Li, Lin, Ashok Kumar Materials Characterization Techniques Sam Zhang; CRC Press,(2008).
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Cullity, B.D., and Stock, R.S., "Elements of X-Ray Diffraction", Prentice-Hall, (2001). 2. Murphy, Douglas B, Fundamentals of Light Microscopy and Electronic Imaging, Wiley-Liss, Inc. USA, (2001). 3. Tyagi, A.K., Roy, Mainak, Kulshreshtha, S.K., and Banerjee, S., Advanced Techniques for Materials Characterization, Materials Science Foundations (monograph series), Volumes 49 – 51, (2009). Volumes 49 – 51, (2009). 4. Wendlandt, W.W., Thermal Analysis, John Wiley & Sons, (1986). 5. Wachtman, J.B., Kalman, Z.H., Characterization of Materials, ButterworthHeinemann, (1993)
WEB SOURCES	<ol style="list-style-type: none"> 1. https://cac.annauniv.edu/uddetails/udpg_2015/77.%20Mat%20Sci(AC).pdf 2. http://www.digimat.in/nptel/courses/video/113106034/L11.html 3. https://nptel.ac.in/courses/104106122 4. https://nptel.ac.in/courses/118104008 5. https://www.sciencedirect.com/journal/materials-characterization

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Describe the TGA, DTA, DSC and TMA thermal analysis techniques and make interpretation of the results.	K1, K3
CO2	The concept of image formation in Optical microscope, developments in other specialized microscopes and their applications.	K2
CO3	The working principle and operation of SEM, TEM, STM and AFM.	K2, K3
CO4	Understood Hall measurement, four –probe resistivity measurement, C-V, I-V, Electrochemical, Photoluminescence and electroluminescence experimental techniques with necessary theory.	K3, K4
CO5	The theory and experimental procedure for x- ray diffraction and some important spectroscopic techniques and their applications.	K4,K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	2	2	2	2	3
CO2	3	3	3	2	2	2	2	2	2	2
CO3	3	3	2	2	2	3	2	2	2	2
CO4	2	2	2	3	2	3	2	2	2	2
CO5	2	2	2	2	2	2	3	2	2	2

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	2	2	2	2	2	3
CO2	3	3	3	2	2	2	2	2	2	2
CO3	3	3	2	2	2	3	2	2	2	2
CO4	2	2	2	3	2	3	2	2	2	2
CO5	2	2	2	2	2	2	3	2	2	2

Elective - List 3 – 19. MEDICAL PHYSICS	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	MEDICAL PHYSICS	ELECTIVE				3	4	75

Pre-Requisites

Fundamentals of physiological concepts, Basics of instruments principle,

Learning Objectives

- To understand the major applications of Physics to Medicine
- To study the aid of different medical devices such as X-ray machines, gamma camera, accelerator and nuclear magnetic resonance.
- To outline the principles of Physics of different medical radiation devices and their modern advances, especially in medical radiation therapy and different applications in medical physics.
- To introduce the ideas of Radiography.
- To form a good base for further studies like research.

UNITS	CourseDetails
UNIT I: X-RAYS AND TRANSDUCERS	Electromagnetic Spectrum – Production of X-Rays – X-Ray Spectrum – Bremsstrahlung – Characteristic X-Ray – X-Ray Tubes – Coolidge Tube – X-Ray Tube Design – Thermistors – photo electric transducers – Photo voltaic cells – photo emissive cells –Photoconductive cells– piezoelectric transducer
UNIT II: BLOOD PRESSURE MEASUREMENTS	Introduction –□sphygmomanometer – Measurement of heart rate – basic principles of electrocardiogram (ECG) –Basic principles of electro-neurography (ENG) – Basic principles of magnetic resonance imaging (MRI).
UNIT III: RADIATION PHYSICS	Radiation Units – Exposure – Absorbed Dose – Rad to Gray – Kera Relative Biological Effectiveness –Effective Dose – Sievert (Sv) – Inverse Square Law – Interaction of radiation with Matter – Linear Attenuation Coefficient – Radiation Detectors –Thimble Chamber – Condenser Chambers – Geiger Counter – Scintillation Counter
UNIT IV: MEDICAL IMAGING PHYSICS	Radiological Imaging – Radiography – Filters – Grids – Cassette – X-Ray Film – Film processing – Fluoroscopy – Computed Tomography Scanner – Principal Function – Display – Mammography – Ultrasound Imaging – Magnetic Resonance Imaging – Thyroid Uptake System – Gamma Camera (Only Principle, Function and display)

UNITV: RADIATION PROTECTION	Principles of Radiation Protection – Protective Materials – Radiation Effects – Somatic – Genetic Stochastic and Deterministic Effect – Personal Monitoring Devices – TLD Film Badge – Pocket Dosimeter
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UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism
TEXT BOOKS	<ol style="list-style-type: none"> 1. Dr.K.Thayalan ,<i>Basic Radiological Physics</i>, Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi, 2003. 2. Curry, Dowdey and Murry, <i>Christensen's Physics of Diagnostic Radiology: -LippincotWilliams and Wilkins</i>, 1990. 3. FM Khan, <i>Physics of Radiation Therapy</i>, William and Wilkins, 3rd ed, 2003. 4. D. J. Dewhurst, <i>An Introduction to Biomedical Instrumentation</i>, 1st ed, Elsevier Science, 2014. 5. R.S. Khandpur, <i>Hand Book of Biomedical Instrumentations</i>, 1st ed, TMG, New Delhi, 2005.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Muhammad Maqbool, <i>An Introduction to Medical Physics</i>, 1st ed, Springer International Publishing, 2017. 2. Daniel Jiráček, FrantišekVíteček, <i>Basics of Medical Physics</i>, 1st ed, Charles University, Karolinum Press, 2018 3. Anders Brahme, <i>Comprehensive Biomedical Physics</i>, Volume 1, 1st ed, Elsevier Science, 2014. 4. K. Venkata Ram, <i>Bio-Medical Electronics and Instrumentation</i>, 1st ed, Galgotia Publications, New Delhi, 2001. 5. John R. Cameron and James G. Skofronick, 2009, <i>Medical Physics</i>, John Wiley Interscience Publication, Canada, 2nd edition.
WEB SOURCES	<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/108/103/108103157/ 2. https://www.studocu.com/en/course/university-of-technology-sydney/medical-devices-and-diagnostics/225692 3. https://www.technicalsymposium.com/alllecturenotes_biomed.html 4. https://lecturenotes.in/notes/17929-note-for-biomedical-instrumentation-bi-by-deepraj-adhikary/78 5. https://www.modulight.com/applications-medical/

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Learn the fundamentals, production and applications of X-rays.	K1
CO2	Understand the basics of blood pressure measurements. Learn about sphygmomanometer, EGC, ENG and basic principles of MRI.	K2
CO3	Apply knowledge on Radiation Physics	K3
CO4	Analyze Radiological imaging and filters	K4
CO5	Assess the principles of radiation protection	K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	1	2	3	3	1	3
CO2	3	3	3	2	1	2	3	3	1	3
CO3	3	3	3	2	1	2	3	3	1	3
CO4	3	3	3	2	1	2	3	3	1	3
CO5	3	3	3	1	1	2	3	3	1	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	1	1	2	3	3	1	3
CO2	3	3	3	2	1	2	3	3	1	3
CO3	3	3	3	2	1	2	3	3	1	3
CO4	3	3	3	2	1	2	3	3	1	3
CO5	3	3	3	1	1	2	3	3	1	3

Elective - List 3 – 20. SOLID WASTE MANAGEMENT	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	SOLID WASTE MANAGEMENT	ELECTIVE				3	4	75

Pre-Requisites
Basic knowledge of solid waste and its type
Learning Objectives
<ul style="list-style-type: none"> ➤ To gain basic knowledge in solid waste management procedures ➤ To gain industry exposure and be equipped to take up a job. ➤ To harness entrepreneurial skills. ➤ To analyze the status of solid waste management in the nearby areas. ➤ To sensitize the importance of healthy practices in waste managements

UNITS	Course Details
UNIT I: SOLID WASTE MANAGEMENT	Introduction - Definition of solid waste - Types – Hazardous Waste: Resource conservation and Renewal act – Hazardous Waste: Municipal Solid waste and non-municipal solid waste.
UNIT II: SOLID WASTE CHARACTERISTICS	Solid Waste Characteristics: Physical and chemical characteristics - SWM hierarchy - factors affecting SW generation
UNIT III: TOOLS AND EQUIPMENT	Tools and equipment - Transportation - Disposal techniques - Composting and land filling technique
UNIT IV: ECONOMIC DEVELOPMENT	SWM for economic development and environmental protection Linking SWM and climate change and marine litter.
UNIT V: INDUSTRIAL VISIT	SWM Industrial visit – data collection and analysis - presentation
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. Handbook of Solid Waste Management /Second Edition, George Tchobanoglous, McGraw Hill (2002). 2. Prospects and Perspectives of Solid Waste Management, Prof. B BHosett, New Age International (P) Ltd (2006). 3. Solid and Hazardous Waste Management, Second Edition, M.N Rao, BS Publications / BSPBooks (.(2020 4. Integrated Solid Waste Management Engineering Principles and Management, Tchobanoglous, McGraw Hill (2014). 5. Solid Waste Management (SWM), Vasudevan Rajaram, PHI learning private limited, 2016
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Municipal Solid Waste Management, Christian Ludwig, Samuel Stucki, Stefanie Hellweg, Springer Berlin Heisenberg, 2012 2. Solid Waste Management Bhide A. D Indian National Scientific Documentation Centre, New Delhi Edition 1983 ASIN: B0018MZ0C2 3. Solid Waste Tchobanoglous George; Kreith, Frank McGraw Hill Publication, New Delhi 2002, ISBN 9780071356237 4. Environmental Studies Manjunath D. L. Pearson Education Publication, New Delhi, 2006 ISBN-I3: 978-8131709122 5. Solid Waste Management Sasikumar K. PHI learning, New Delhi, 2009 ISBN 8120338693
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.meripustak.com/Integrated-Solid-Waste-Management-Engineering-Principles-And-Management-Issues-125648 2. https://testbook.com/learn/environmental-engineering-solid-waste-management/ 3. https://www.meripustak.com&gclid=Cj0KCQjwuuKXBhCRARIsA-gM0iVpismAJN93CHA1sX6NuNeOKLXfQJ_jxHCOVH3QXjJ1iACq30KofoaAmFsEALw_wcB 4. https://images.app.goo.gl/tYiW2gUPfS2cxdD28 5. https://amzn.eu/d/5VUSTDI

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Gained knowledge in solid waste management	K1
CO2	Equipped to take up related job by gaining industry exposure	K5
CO3	Develop entrepreneurial skills	K3
CO4	Will be able to analyze and manage the status of the solid wastes in the nearby areas	K4
CO5	Adequately sensitized in managing solid wastes in and around his/her locality	K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	3	3	2	2	2	2	2	3
CO2	2	3	3	2	2	2	3	3	3	2
CO3	2	3	2	2	2	2	3	3	3	2
CO4	3	2	2	2	2	3	3	3	3	2
CO5	2	3	3	2	2	2	3	3	2	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	3	3	3	2	2	2	2	2	3
CO2	2	3	3	2	2	2	3	3	3	2
CO3	2	3	2	2	2	2	3	3	3	2
CO4	3	2	2	2	2	3	3	3	3	2
CO5	2	3	3	2	2	2	3	3	2	3

Elective - List 3 –21. SEWAGE AND WASTE WATER TREATMENT AND REUSE	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	SEWAGE AND WASTE WATER TREATMENT AND REUSE	ELECTIVE				3	4	75

Pre-Requisites

Basic knowledge of classification of sewage and solid waste and its harmful effects.

Learning Objectives

- To gain basic knowledge in sewage and waste water Treatment procedures
- To gain industry exposure and be equipped to take up job.
- To harness entrepreneurial skills.
- To analyze the status of sewage and waste water management in the nearby areas.
- To sensitize the importance of healthy practices in waste water management.

UNITS	Course Details
UNIT I: RECOVERY & REUSE OF WATER	Recovery & Reuse of water from Sewage and Waste water: Methods of recovery: Flocculation - Sedimentation - sedimentation with coagulation - Filtration - sand filters - pressure filters - horizontal filters - vector control measures in industries - chemical and biological methods of vector eradication
UNIT II: DISINFECTION	Disinfection: Introduction to disinfection and sterilization: Disinfectant - UV radiation - Chlorination - Antisepsis - Sterilant - Aseptic and sterile - Bacteriostatic and Bactericidal - factors affecting disinfection.
UNIT III: CHEMICAL DISINFECTION	Chemical Disinfection: Introduction - Theory of Chemical Disinfection - Chlorination Other Chemical Methods - Chemical Disinfection Treatments Requiring - Electricity - Coagulation/Flocculation Agents as Pretreatment - Disinfection By-Products(DBPs)
UNIT IV: PHYSICAL DISINFECTION	Physical Disinfection: Introduction - Ultraviolet Radiation - Solar Disinfection - Heat Treatment - Filtration Methods - Distillation - Electrochemical Oxidation Water Disinfection by Microwave Heating.
UNIT V: INDUSTRIAL VISIT	Industrial visit – data collection and analysis - presentation
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. Drinking water and disinfection technique, Anirudhha Balachandra, CRC press (2013) 2. Design of Water and Wastewater Treatment Systems (CV-424/434), ShashiBushman,(2015) Jain Bros 3. Integrated Water Resources Management, Sarbhukan M M, CBS PUBLICATION (2013) 4. C.S. Rao, Environmental Pollution Control Engineering, New Age International, 2007 5. S.P. Mahajan, Pollution control in process industries, 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Handbook of Water and Wastewater Treatment Plant Operations, Frank. R Spellman, CRC Press, 2020 2. Wastewater Treatment Technologies, MritunjayChaubey, Wiley, 2021. 3. Metcalf and Eddy, Wastewater Engineering, 4th ed., McGraw Hill Higher Edu., 2002. 4. W. Wesley Eckenfelder, Jr., Industrial Water Pollution Control, 2nd Edn., McGraw Hill Inc., 1989 5. Lancaster, Green Chemistry: An Introductory Text, 2nd edition, RSC publishing, 2010.
WEB SOURCES	<ol style="list-style-type: none"> 1. https://www.google.co.in/books/edition/Drinking_Water_DisinfectionTechniques/HVbNBQAAQBAJ?hl=en 2. https://www.meripustak.com/Integrated-Solid-Waste-Management-Engineering-Principles-And-Management-Issues-125648? 3. https://www.meripustak.com&gclid=Cj0KCQjwuuKXBhCRARIsAC-gM0iVpismAJN93CHA1sX6NuNeOKLXfQJjxHCOVH3QXjJ1iACq30KofoaAmFsEALw_wcB 4. https://www.meripustak.com&gclid=Cj0KCQjwuuKXBhCRARIsAC-gM0iVpismAJN93CHA1sX6NuNeOKLXfQJjxHCOVH3QXjJ1iACq30KofoaAmFsEALw_wcB 5. https://www.amazon.in/Design-Wastewater-Treatment-Systems-CV-424/dp/B00IG2PI6K/ref=asc_df_B00IG2PI6K/?tag=googleshopmob-21&linkCode=df0&hvadid=397013004690&hvpos=&hvnetw=&hvrnd=4351305881865063672&hvpone=&hvptwo=&hvqmt=&hvdev=m&hvdvcmdl=&hvlocint=&hvlocphy=9061971&hvtargid=pla-890646066127&pssc=1&ext_vrnc=hi

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Gained knowledge in solid waste management	K1
CO2	Equipped to take up related job by gaining industry exposure	K5
CO3	Develop entrepreneurial skills	K3
CO4	Will be able to analyze and manage the status of the solid wastes in the nearby areas	K4
CO5	Adequately sensitized in managing solid wastes in and around his/her locality	K5
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C01	3	2	3	3	3	2	3	2	3	2
C02	2	3	2	2	3	3	2	3	2	2
C03	2	2	2	2	2	3	3	3	3	2
C04	3	2	3	3	2	3	3	3	3	2
C05	2	2	2	2	3	3	2	2	2	2

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
C01	3	2	3	3	3	2	3	2	3	2
C02	2	3	2	2	3	3	2	3	2	2
C03	2	2	2	2	2	3	3	3	3	2
C04	3	2	3	3	2	3	3	3	3	2
C05	2	2	2	2	3	3	2	2	2	2

Elective - List 3 – 22. SOLAR ENERGY UTILIZATION	I/II YEAR – SECOND/THIRD SEMESTER
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Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks
	SOLAR ENERGY UTILIZATION	ELECTIVE				3	4	75
Pre-Requisites								
Basic knowledge of heat energy, way of transfer of heat, solar energy, materials types								
Learning Objectives								
<ul style="list-style-type: none"> ➤ To impart fundamental aspects of solar energy utilization. ➤ To give adequate exposure to solar energy related industries ➤ To harness entrepreneurship skills ➤ To understand the different types of solar cells and channelizing them to the different sectors of society ➤ To develop an industrialist mindset by utilizing renewable source of energy 								

UNITS	Course Details
UNIT I: HEAT TRANSFER & RADIATION ANALYSIS	Conduction, Convection and Radiation – Solar Radiation at the earth's surface - Determination of solar time – Solar energy measuring instruments.
UNIT II: SOLAR COLLECTORS	Physical principles of conversion of solar radiation into heat flat plate collectors - General characteristics – Focusing collector systems – Thermal performance evaluation of optical loss.
UNIT III: SOLAR HEATERS	Types of solar water heater - Solar heating system – Collectors and storage tanks – Solar ponds – Solar cooling systems.
UNIT IV: SOLAR ENERGY CONVERSION	Photo Voltaic principles – Types of solar cells – Crystalline silicon/amorphous silicon and Thermo - electric conversion - process flow of silicon solar cells- different approaches on the process-texturization, diffusion, Antireflective coatings, metallization.
UNIT V: NANOMATERIALS IN FUEL CELL APPLICATIONS	Use of nanostructures and nanomaterials in fuel cell technology - high and low temperature fuel cells, cathode and anode reactions, fuel cell catalysts, electrolytes, ceramic catalysts. Use of Nano technology in hydrogen production and storage. Industrial visit – data collection and analysis - presentation
UNIT VI: PROFESSIONAL COMPONENTS	Expert Lectures, Online Seminars - Webinars on Industrial Interactions/Visits, Competitive Examinations, Employable and Communication Skill Enhancement, Social Accountability and Patriotism

TEXT BOOKS	<ol style="list-style-type: none"> 1. Solar energy utilization -G.D. Rai –Khanna publishers – Delhi 1987. 2. Maheshwar Sharon, Madhuri Sharon, Carbon “Nano forms and Applications”, Mc Graw-Hill, 2010. 3. Soteris A. Kalogirou, „Solar Energy Engineering: Processes and Systems“,
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	<p>Academic Press, London, 2009</p> <p>4. Tiwari G.N, “Solar Energy – Fundamentals Design, Modelling and applications, Narosa Publishing House, New Delhi, 2002</p> <p>5. Sukhatme S.P. Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.</p>
REFERENCE BOOKS	<p>1. Energy – An Introduction to Physics – R.H.Romer, W.H.Freeman.(1976)</p> <p>2. Solar energy thermal processes – John A.Drife and William. (1974)</p> <p>3. John W. Twidell& Anthony D.Weir, ‘Renewable Energy Resources,2005</p> <p>4. John A. Duffie, William A. Beckman, Solar Energy: Thermal Processes, 4th Edition, John Wiley and Sons, 2013</p> <p>5. Duffie, J.A., Beckman, W.A. , “Solar Energy Thermal Process”, John Wiley and Sons,2007.</p>
WEB SOURCES	<p>1. https://pdfs.semanticscholar.org/63a5/a69421b69d2ce9f359bbfc86c63556f9a4fb</p> <p>2. https://books.google.vg/books?id=l-XHcwZo9XwC&sitesec=buy&source=gbs_vpt_read</p> <p>3. www.nptel.ac.in/courses/112105051</p> <p>4. www.freevideolectures.com</p> <p>5. http://www.e-booksdirectory.com</p>

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Gained knowledge in fundamental aspects of solar energy utilization	K1
CO2	Equipped to take up related job by gaining industry exposure	K3
CO3	Develop entrepreneurial skills	K5
CO4	Skilled to approach the needy society with different types of solar cells	K4
CO5	Gained industrialist mindset by utilizing renewable source of energy	K2, K3
K1 - Remember; K2 – Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate;		

MAPPING WITH PROGRAM OUTCOMES:

Map course outcomes (CO) for each course with program outcomes (PO) and program specific outcomes (PSO) in the 3-point scale of STRONG (3), MEDIUM (2) and LOW (1).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	2	2	2	3	2
CO2	2	3	2	2	3	3	2	3	2	2
CO3	2	3	2	2	2	2	3	3	3	2
CO4	2	2	2	3	2	3	2	3	3	2
CO5	2	2	3	2	3	3	3	3	3	3

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
C01	3	2	3	3	3	2	2	2	3	2
C02	2	3	2	2	3	3	2	3	2	2
C03	2	3	2	2	2	2	3	3	3	2
C04	2	2	2	3	2	3	2	3	3	2
C05	2	2	3	2	3	3	3	3	3	3

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Paper - 3(a): MATERIALS SCIENCE

Preamble: To expose the students with theoretical aspects of materials science. To provide the knowledge about phase diagrams, mechanical properties, ceramics, polymers, plastics and crystals.

Unit – I: Phase Diagrams (12 hrs)

Solid solutions and intermediate phases – Equilibrium phase diagrams, Cu-Ni, Pb-Sn, Al-Cu system phase diagrams – Free energy and equilibrium phase diagrams – Nucleation and growth – Martensitic transformation – Strengthening mechanisms – Iron-Carbon system – Alloy steels – Aluminium-Copper system – Copper-Zinc system – Corrosion

Unit - II: Mechanical Properties (12 hrs)

Stress- Strain curve – Elastic deformation: Characteristics, Atomic mechanism, Shear stress, Bulk modulus, Strain energy, Strain deformation – Viscous deformation: Spring-Dashpot models – Anelastic and Viscoelastic deformation: Viscoelastic models – Plastic deformation: Dislocations and Stress-strain curves, Plasticity theory – Fracture: Ideal fracture, Brittle fracture, Fracture mechanics, Cohesive models, Ductile fracture – Mechanical testing

Unit - III: Ceramics (12 hrs)

Structure of ceramics – Production of ceramics: Raw materials, Forming and Post-forming processes – Production of glass: Melting of glass, Glass forming and annealing – Mechanical properties of ceramics – Wear and erosion resistance – Thermal shock – Silica-Alumina system – Commercial systems: Zirconia, Sialones, Cement and Concrete

Unit - IV: Polymers and Plastics (12 hrs)

Molecular structure: Monomers & Polymers, Synthesis, Molecular weight measurement, Branching & Tacticity, Copolymers and blend – Mechanics of polymer chain: Freely jointed chains, Entanglements, Rubber elasticity – Thermoplastic melts: Viscosity, Shear thinning, Processing, Extrusion – Amorphous polymers: Solidification, glass transition, Various models – Crystalline polymers – Crosslinked polymers: Elastomers, Thermosets – Liquid crystal polymers – Mechanical properties: Stress-Strain behaviour – Chemical properties

Unit - V: Crystals (12 hrs)

Crystal growth from solution – Melt growth techniques: Bridgman method, Czochralski crystal pulling technique, Crystal growth from Vapour phase – Crystal Imperfections – Point defects: Vacancies, interstitials, Impurities, electronic defects – Line defects: Edge dislocation, Screw dislocation – Surface defects: Grain boundaries, Tilt boundaries, Twin boundaries, Stacking faults, Ferromagnetic domain walls – Volume defects: Cracks, Voids

Books for Study and References

1. J.C.Anderson, K.D.Leaver, P. Leever and R.D.Rowlings, Materials Science for Engineers, Nelson Thomas Ltd, First Indian reprint, 2010
2. M.Arumugam, Materials Science, Anuradha Agencies, Publishers, Second Edition, Fifth Reprint, 2005
3. R,Balasubramaniam, Materials Science and Engineering, Wiley India (P) Ltd, 2010
4. V.Raghavan, Materials Science for Engineering, Prentice Hall of India Pvt Ltd, 2006

Paper - 3(b): NANOMATERIALS

Preamble: To felicitates the knowledge on nanomaterials. To make the students understanding the fundamental aspects of nanomaterials, synthesis, nanostructures, properties and characterization techniques

Unit-I: Synthesis (12 hrs)

Sol-Gel and Precipitation technologies - Ball milling - RF plasma - Combustion Flame - Chemical Vapor Condensation process – Electrodeposition - Laser synthesis - Gas phase condensation - Sonochemical.

Unit-II: Nanostructures (12 hrs)

Preparation of quantum nanostructures: Preparation - Size and Dimensionality Effects – Excitations - Single-Electron Tunneling - Applications. Nanomachines and Nano devices: Micoelectrochemical systems – Nano electrochemical systems - Molecular and Super molecular switches.

Unit-III: Properties (12 hrs)

Properties of Individual Nanoparticles: Metal Nanoclusters – Semiconducting Nanoparticles - Rare Gas and Molecular clusters. Bulk Nanostructured Materials: Solid disordered Nanostructure - Nanostructured crystals.

Unit - IV: Characterization Techniques (12 hrs)

Structural: Powder XRD & particle size determination, Neutron diffraction; Spectroscopic: X-ray Photoelectron (XPS), Photoluminescence, Impedance and Energy Dispersive X-ray (EDAX) spectroscopy.

Unit - V: Characterization Techniques (12 hrs)

Thermal: Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC); Microscopic: Atomic Force Microscopy (AFM); Electrical and Magnetic: Four - probe method, Vibrating sample Magnetometer.

Books for Study and Reference

1. Evgenij Barsoukov and J. Ross Macdonald : Impedance Spectroscopy : Theory, Experiment and Applications, (John Wiley & Sons, Inc., Hoboken, New Jersey, second edition), 2005.
2. G. Cao: Nanostructures & Nanomaterials: Synthesis, Properties & Applications, (Imperial College Press), 2004.
3. Koch CC, Nanostructured Materials processing, properties and potential applications, Williams Andrew Publishing, Noyes, 2002
4. Pavia, Lampman, Kriz and Vyvyan, Spectroscopy, Cengage Learning India Pvt Ltd., 2011.
5. Willard, Merritt, Dean and Settle, Instrumental Methods of Analysis. CBS Publishers & Distributors, Delhi, 1986.
6. J.Ross Mcdonald, Impedance Spectroscopy Emphasizing solid materials and systems, John Wiley & sons, New York, 1996.
7. T. Pradeep, NANO: The Essentials, Tata Mc Graw-Hill Pvt. Ltd., New Delhi, 2007.
8. Charles P. Poole Jr & Frank J. Owens, Introduction to Nanotechnology, John Wiley & Sons (Asia) Pvt. Ltd., New Delhi, 2006.
9. Jackie Y.Ying, Nanostructured Materials, Academic Press, USA, 2001.

Paper – 3(c): SPACE PHYSICS

Preamble: To enlighten the students with the concepts of space physics. To make the students understanding the concepts of remote sensing of earth's climate system, space and plasma physics, space weather, introduction to magneto hydrodynamics, x-ray astronomy

Unit – I: Remote Sensing of Earth's Climate System (12 hrs)

Remote sensing of earth's climate system- requirements for remote sensing of climate system- methodology- constrains- basic concept of remote sensing- surface factors- atmospheric factors- instrumental factors- using reflected sunlight- global vegetation remote sensing- using thermal emission- global sea surface temperature measurement- radar altimetry- surface effects- atmospheric effects- ocean and ice monitoring by radar altimetry.

Unit - II: Space and Plasma Physics (12 hrs)

Basic plasma physics- principle- application- space plasma- the frozen in-flux-MHD plasma waves- solar wind and IMF- collision less shocks- bow shocks- shock jumps- shock structure- shock acceleration- magnetic reconnection- terrestrial magnetosphere- closed, open and flux transfer events- storms , sub storms- solar wind interaction with ionosphere- planets- insulator bodies(moon)- comets.

Unit – III: Space Weather (12 hrs)

Space weather- structure of sun- solar cycle- solar activity- coronal heating. The solar wind- wind- Aurora- Auroral sub storms- co-rotating interaction region(CIR)- solar flares- the ionosphere- solar energetic particle events(SEP)- coronal mass ejections(CME) and geomagnetic storms- Halo CME's- interplanetary CME's- magnetic clouds.

Unit - IV: Introduction to Magneto Hydrodynamics (12 Hrs)

Maxwell's equations in MHD- magnetic Reynold's number- Alfven speed- plasma beta parameter- force free magnetic field- magnetic buoyancy- magneto sttic equilibrium- magnetic reconnection- current sheet- acoustic waves- Alfven waves compressional Alfven waves- magneto acoustic waves- inertial waves.

Unit – V: X-Ray Astronomy (12 hrs)

Origin of X-rays astronomy- X-ray binaries- black hole- neutron stars- pulsars- white dwarfs- clusters of galaxies.

Books for Study and References

1. Thomas E Cravens, Physics of Solar System Plasma, (Cambridge University Press), 1997.
2. Thomas I Gombosi, Physics for Space Environment, (Cambridge University Press), 2004.
3. Louise K Hara and Keith O Mason, Space Science, (University of London, World Scientific Publishing Co.), 2004.
4. Margaret G Kivelson and Christopher T Russell, Introduction to Space Physics, (Cambridge University Press), 1995.

Paper – 3(d) : CRYSTAL GROWTH

Preamble: To introduce the knowledge on crystal growth and characterization. To expose the students with theories of nucleation & crystal growth, crystal growth from various techniques such as, solution, melt and vapour phase and their characterization.

Unit – I: Fundamentals of Crystal Growth (12 hrs)

Importance of crystal growth – Classification of crystal growth methods – Basic steps: Generation, transport and adsorption of growth reactants – Nucleation: Kinds of nucleation – Classical theory of nucleation: Gibbs Thomson equations for vapour and solution – Kinetic theory of nucleation – Becker and Doring concept on nucleation rate – Energy of formation of a spherical nucleus – Statistical theory on nucleation: Equilibrium concentration of critical nuclei, Free energy of formation.

Unit – II: Theories of Crystal Growth (12 hrs)

An introductory note to Surface energy theory, Diffusion theory and Adsorption layer theory – Concepts of Volmer theory, Bravais theory, Kossel theory and Stranski's treatment – Two-dimensional nucleation theory: Free energy of formation, Possible shapes and Rate of nucleation – Mononuclear, Polynuclear and Birth and Spread models – Modified Birth and Spread model – Crystal growth by mass transfer processes: Burton, Cabrera and Frank (BCF) bulk diffusion model, Surface diffusion growth theory.

Unit – III: Experimental Crystal Growth-Part-I: Melt Growth Techniques (12 hrs)

Basics of melt growth – Heat and mass transfer – Conservative growth processes: Bridgman-Stockbarger method – Czochralski pulling method – Kyropoulos method – Non-conservative processes: Zone-refining – Vertical and horizontal float zone methods – Skull melting method – Vernueil flame fusion method.

Unit – IV: Experimental Crystal Growth-Part-II: Solution Growth Techniques (12 hrs)

Growth from low temperature solutions: Selection of solvents and solubility – Meir's solubility diagram – Saturation and supersaturation – Metastable zone width – Growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods – Crystal growth in Gel media: Chemical reaction and solubility reduction methods – Growth from high temperature solutions: Flux growth Principles of flux method – Choice of flux – Growth by slow evaporation and slow cooling methods – Hydrothermal growth method.

Unit – V: Experimental Crystal Growth-Part-III: Vapour Growth Techniques (12 hrs)

Basic principles – Physical Vapour Deposition (PVD): Vapour phase crystallization in a closed system – Gas flow crystallization – Chemical Vapour Deposition (CVD): Advantageous and disadvantageous – Growth by chemical vapour transport reaction: Transporting agents, Sealed capsule method, Open flow systems – Temperature variation method: Stationary temperature profile, Linearly time varying temperature profile and Oscillatory temperature profile.

Books for Study and Reference

1. 'Crystal Growth Processes' by J.C. Brice, 1986, John Wiley and Sons, New York.
2. 'Crystallization' by J.W. Mullin, 2004, Elsevier Butterworth-Heinemann, London.
3. 'Crystal Growth: Principles and Progress' by A.W. Vere, 1987, Plenum Press, New York.

4. 'Crystals: Growth, Morphology and Perfection' by Ichiro Sunagawa, 2005, Cambridge University Press, Cambridge.
5. 'Crystal Growth' by B.R. Pamplin, 1975, Pergamon Press, Oxford.

PAPER – 3 (e): Thin film

Preamble: To expose the students with knowledge of understanding the basic preparation and to get knowledge about the various properties of thin films. To make the understand the preparation and various necessary techniques used for analyzing the thin films

Unit- I: Preparation of Thin Films

(12 hrs)

Spray pyrolytic process – characteristic feature of the spray pyrolytic process – ion plating – Vacuum evaporation – Evaporation theory – The construction and use of vapour sources – sputtering Methods of sputtering – Reactive sputtering – RF sputtering - DC planar magnetron sputtering .

Unit - II: (Thickness Measurement and Nucleation and Growth in Thin Film

(12 hrs)

Thickness measurement: electrical methods – optical interference methods – multiple beam interferometry – Fizeau – FECO methods – Quartz crystal thickness monitor. Theories of thin film nucleation – Four stages of film growth incorporation of defects during growth.

Unit - III: Electrical Properties of Metallic Thin Films

(12 hrs)

Sources of resistivity in metallic conductors – sheet resistance - Temperature coefficient of resistance (TCR) – influence of thickness on resistivity – Hall effect and magneto resistance – Annealing – Agglomeration and oxidation.

Unit - IV: Transport Properties of Semiconducting and Insulating Films

(12 hrs)

Semiconducting films ; Theoretical considerations - Experimental results – Photoconduction – Field effect thin films – transistors, Insulation films Dielectric properties – dielectric losses – Ohmic contacts – Metal – Insulator and Metal – metal contacts – DC and AC conduction mechanism

Unit - V: Optical Properties of Thin Films and Thin Films Solar Cells

(12 hrs)

Thin films optics –Theory – Optical constants of thin films – Experimental techniques – Multilayer optical system – interference filters – Antireflection coating ,Thin films solar cells : Role, Progress , and production of thin solar cells – Photovoltaic parameter, Thin film silicon (Poly crystalline) solar cells : current status of bulk silicon solar cells – Fabrication technology – Photo voltaic performance : Emerging solar cells : GaAs and CuInSe.

Books for study and reference

1. Hand book of Thin films Technology: L I Maissel and R Clang .
2. Thin film Phenomena : K L Chopra .
3. Physics of thin films, vol. 12 , Ed George Hass and others .
4. Thin films solar cells – K L Chopra and S R Das .
5. Thin films processes – J L vilsan
6. vacuum deposition of thin films – L Holland .
7. The use of thin films in physical investigation – J C Anderson.
8. Thin films technology – Berry, Koil and Harri

PAPER – 3(f): ELECTRONIC STRUCTURE CALCULATION

Preamble: To introduce knowledge on electronic structure calculation. To make the students to understand basic concepts, various analysis on natural bond Orbitals, normal coordinates and different experimental methods

Unit – I: FTIR Raman Spectra (12 hrs)

Normal modes of vibration – Group frequencies – Origin of Infrared and Raman spectra – Infrared and Raman activity – IR and Raman spectral characteristics – FTIR and Raman spectra and their interpretation – Factors affecting Vibrational spectra - Hydrogen bonding – Structure elucidation using IR and Raman spectra – Resonance Raman scattering – Vibrational spectra of aromatic molecules

Unit – II: Quantum Chemical Computation (12 hrs)

Molecular Orbital Theory - Basis set – Electronic structure methods – Semi empirical methods – *Ab initio* methods - density functional theory methods - Z-matrix – geometry optimization – Harmonic Vibrational analysis – Atoms in molecules charges and Bond order – Potential energy surface – Mulliken population analysis – Vibrational circular dichroism intensities – Software: MOPAC, Gaussian

Unit – III: Natural Bond Orbital Analysis (12 hrs)

Natural bond orbitals and one-particle density matrix – Atomic eigenvectors – Natural atomic orbitals and natural population analysis – Bond eigenvectors – natural hybrids and natural bond orbitals – Natural localized molecular orbitals – Hyperconjugative interaction in NBO analysis.

Unit – IV: Normal Coordinate Analysis (12 hrs)

Classical theory of molecular vibrations – Construction of force constant matrix F – Internal coordinates in force field calculations – Theory of lattice vibrations – Scale factor calculation – Intensity calculation – Natural internal coordinates – MOLVIB software: General structure input data – Control parameters

Unit – V: Experimental Techniques (12 hrs)

IR spectrometer instrumentation – IR sources – Sample handling techniques – IR detectors – FTIR spectrometer – FTIR Raman spectrometer – Sample handling techniques – Laser exciting sources – Raman detectors – SERS techniques.

BOOKS FOR REFERENCE

1. Brain Smith, Infrared Spectral Interpretation – A Systematic Approach , CRC Press, New York, (1999)
2. G.Aruldas, Molecular structure and spectroscopy, prentice-Hall of India (P) Ltd., New Delhi-1110001, (2001).
3. G.Socrates, Infrared characteristic group frequencies, John Wiley & Sons, New York, (1980)
4. Ira N.Levine, Quantum chemistry V Ed., Prentice Hall International, Inc., London (2003).
5. Alan E. Reed et al., Chem. Rev. 88 (1988) 899-906.
6. Tom Sundius, MOLVIB User's guide Ver. 2, Helsinki (June 2002)
7. Robert M. Silverstein et al., Spectrometric identification of organic compounds, John Wiley & Sons, Inc., New York, (2003).

PAPER – 3(g) : NONLINEAR DYNAMICS

Preamble: To understand the basic concepts of nonlinear dynamics. This course provides knowledge about the effects of nonlinearity on dynamical systems

Unit – I: Nonlinearity, linear and nonlinear oscillators (12 hrs)

Dynamical systems - linear and nonlinear forces - Mathematical implications of nonlinearity - Working definition of nonlinearity - Effects of nonlinearity-Linear oscillators and predictability - Damped and driven nonlinear oscillators.

Unit – II: Equilibrium points, bifurcations and chaos (12 hrs)

Equilibrium points - General criteria for stability – Classification - Some simple bifurcations - Saddle node, pitch fork, transcritical and Hopf bifurcations - Discrete dynamical systems - Logistic map - Equilibrium points and their stability - period doubling phenomenon - chaos.

Unit – III: Chaos in nonlinear electronic circuits (12 hrs)

Linear and nonlinear circuit elements - nonlinear circuits - Chua's diode - Autonomous case - Bifurcations and chaos - Chaotic dynamics of MLC circuit-Analogue circuit simulation - Some other useful nonlinear circuit - Colpitt's oscillator.

Unit – IV: Fractals (12 hrs)

Self similarity - Properties and examples of fractals - Fractal dimension - Construction and properties of some fractals-Middle one third cantor set-Koch curve - Sierpinski triangle-Julia set - Mandelbrot set - Applications of fractals.

Unit – V: Solitons (12 hrs)

Linear waves - Linear non dispersive wave propagation - Linear dispersive wave propagation - Nonlinear dispersive systems - Korteweg de vries equation - solitary and cnoidal waves - Numerical experiments of Zabusky and Kruskal - birth of solitons - Properties of solitons - applications of solitons.

Book For Study:

Nonlinear dynamics, Integrability, Chaos, Patterns, M. Lakshmanan and S.Rajasekar, Springer, Berlin, 2003.

Books for Reference:

1. Chaos in nonlinear oscillator, controlling and synchronization, M.Lakshmanan and K.Murali (World Scientific, Singapor,1997.)
2. Deterministic chaos, H.G.Schuster, (Verlag,Weinheim,1998.)

PAPER – 3(h): MEDICAL PHYSICS

Preamble: To study the basic concepts of medical physics. To make the students to understanding the concepts of Physics in lungs and breathing, sound in medicine, light in medicine, physics of diagnostic X-rays and cardio vascular systems.

Unit - I: The Physics of the Lungs and Breathing (12 hrs)

The Airways– How the blood interact – Measurement of Lung Volumes – Pressure, Airflow, Volume Relationships of the Lungs – Physics of the Alveoli – The Breathing Mechanism – Airway Resistance – work of Breathing – Physics of some common Lung Diseases. Electricity within the Body: Electric signals – from the Heart (Electro Cardiogram) – From the Brain (Electro encephalogram) – From the Eye (Electro retinogram and electrooculogram) – Magnetic signals from Heart and Brain (Magnetocardiogram and Magnetoencephalogram) – Current Research involving electricity in the body.

Unit – II: Sound in Medicine (12 hrs)

General properties of sound, the body as a drum (percussion in medicine) – The stethoscope – ultrasound pictures of the body – ultrasound to measure motion – physiological effects of ultrasound in therapy – the production of speech – Physics of the ear and hearing : The outer ear – the middle ear – the inner ear – sensitivity of the ears – testing your hearing – deafness and hearing aids

Unit – III: Light in Medicine (12 hrs)

Measurement of light and its units – applications of visible light in medicine – applications of ultraviolet and infrared light in medicine – Lasers in Medicine applications of microscopes in medicine – Physics of eye and vision: Focusing elements of the eye – some other elements of the eye – the retina – the light detector of the eye – how sharp are your eye? Optical illusions and related phenomena – defective vision and its correction – colour vision and chromatic aberration – instruments used in ophthalmology.

Unit – IV: Physics of Diagnostic X-Rays (12 hrs)

Production of X-ray beam – how X-ray are absorbed – making an X-ray image – radiation to patients from X-rays – producing live X-ray images – fluoroscopy – X-ray slices of the body – radiographs taken without film Physics of Radiation Therapy: The dose units used in radiotherapy – the red and the gray – principles of radiation therapy – a short course in radiotherapy planning – megavoltage therapy – short distance radiotherapy or brachytherapy other radiation sources – closing thought of radiotherapy.

Unit – V: Physics of the Cardiovascular System (12 hrs)

Major Components of the Cardiovascular system – O₂ and CO₂ Exchange in the Capillary system – Work done by the Heart – Blood pressure and its measurement Transmural Pressure– Bernoulli's Principle – Blood flow – Heart Sounds – Cardiovascular Diseases – Functions of Blood Cardiovascular Instrumentation: Biopotentials of the Heart – Electrodes – Amplifiers – Patient Monitoring – Defibrillators – Pacemakers

BOOK FOR STUDY

Medical Physics–John R.Cameron & James G.Skofronick (John Wiley&Sons, New York1978)

PAPER – 3(i): RADIATION PHYSICS

Preamble: To teach the students about the basic concepts of radiation physics. To impart knowledge on radiation and interaction, principles of radiation detection and measurement, radiation therapy techniques, diagnostic radiology and radiation protection.

Unit-I: Radiation and Interactions (12 hrs)

Interaction of Electromagnetic radiation with matter – Photoelectric and Compton process – pair production – interaction of particles with matter – neutrons – heavy ions – nuclear reactions and production of radioisotopes – radiation sources – natural and artificial radio active for medical applications – Bethe- Bloch formula.

Unit – II: Principles of Radiation Detection and Measurement (12 hrs)

Radiation units and definitions – G.M. Counter – Scintillation detectors – Solid state detectors – Photofilm method - Pocket dosimeter – TLD - FBX dosimeters.

Unit – III: Radio Therapy Techniques (12 hrs)

Telegamma unit – accelerators for therapy – Iridium and cobalt needles – preparation of tracers and labeled compound – uses of radioisotopes (Gamma and beta) in brachytherapy. Dosimetry in medical applications – beta particles dose computation for biological models – dosimetry of internally administered isotopes Principles and overview of conformal radiotherapy, SRS, SRT and IMRT.

Unit – IV: Diagnostic Radiology (12 hrs)

The physical basis of diagnostic radiology – the diagnostic X-ray tube – electrical circuits – rating of the x-ray unit – factors on which quality and quantity of x-ray production depends – geometric factor which influences the radiographic image – fluoroscopy – tomography – radio isotopes in clinical medicine – rectilinear scanner – gamma camera.

Unit – V: Radiation Protection (12 hrs)

Philosophy behind radiation protection – basic concepts of MPD – recent ICRP recommendations – tissues at risk – risk factor – evaluation of internal and external radiation hazards – transport and waste disposal of radioactive materials.

REFERENCES

1. Meredith and Massay. "Fundamental Physics of Radiology", John Wright & Sons Jones M.E. and Cunningham J, "Physics of Radiology", Charles C. Thomas, USA, 1984.

2. Knoll, "Radiation Detection and Measurement", John Wiley and Sons, New York, 1982.
3. Mould R.F, "Radiation Protection", Adam Hilger's Boston, 1985.
4. Govindarajan K.N, "Advanced Medical Radiation Dosimetry", Prentice Hall of India, New Delhi, 1992

PAPER- 3(j) : ALTERNATIVE ENERGY CONVERSION DEVICES

Preamble: To introduce knowledge on alternative energy sources. To introduce the importance and overview of alternate energy sources. To make the students learn the basics of various energy conversion devices

Unit – I: Introduction and Overview of Alternative Energy Sources and Utilization (12 hrs)

Global energy budget – origins of fossil fuels – Principles of energy conversion: thermodynamic first and second laws – the Carnot cycle – Solar energy: Solar intensity and spectrum – global solar energy potential and current level of utilization – Photovoltaic: history – principles and theoretical limits – Solar cells and modules – semiconductor materials – single and multiple layer p-n junction diodes – Solar cells and modules – maximum power output – energy efficiency – quantum efficiency – Solar cells: characterization and modeling – Photovoltaic utilization.

Unit – II: Fundamentals of Electrochemistry and Electrode Kinetics (12 hrs)

Charge transfer reaction and reaction kinetics – Third-generation solar cells: dye-sensitized photocell – organic/polymer solar cell-Fuel cells: overview of types – basic operation and performance – Fuel cells: catalysis – Fuel cells: charge and mass transport – PEM fuel cells' Molten carbonate fuel cells – Solid oxide fuel cells – Overview of fuel cell systems: fuel-cell stack and thermal management.

Unit – III: Hydrogen as a Renewable Energy Source (12 hrs)

Sources of Hydrogen, Fuel cell – Principle of working – construction and applications – Fuel for Vehicles – Hydrogen Production: Direct electrolysis of water, thermal decomposition of water, biological and biochemical methods of hydrogen production – Storage of Hydrogen: Gaseous, Cryogenic and Metal hydride – Environmental impact.

Unit – IV: Batteries (12 hrs)

Primary and Secondary batteries - principles and application – Lithium batteries, Lithium ion and polymer batteries. Super-capacitors: principles and working, electrode materials synthesis process, fabrication of the devices and their applications.

Unit – V: Biomass Utilization (12 hrs)

Biodiesel and ethanol, Biomass utilization, Nuclear Energy: Potential of Nuclear Energy, International Nuclear Energy Policies and Regulations. Nuclear Energy Technologies – Fuel enrichment, Different Types of Nuclear Reactors, Nuclear Waste Disposal, and Nuclear Fusion.

REFERENCES:

1. Renewable Sources of Energy and Conversion Systems: N.K.Bansal and M.K.Kleman.
2. Principles of Thermal Process : Duffie -Beckman
3. Solar Energy Handbook: Kreith and Kreider (McGrawHill)
4. Solar Cell : Marteen A. Green
5. Solar Hydrogen Energy Systems -T. Ohta (Ed.) (Pergamon Press)
6. Hydrogen Technology for Energy – D.A.Maths (Noyes Data Corp.)
7. Handbook : Batteries and Fuel cell – Linden (Mc.Graw Hill)
8. Batteries Volume (I) and (II) – Collins
9. Fuel Cell Fundamentals :O'Hayre, Suk-Won Cha, Whitney Colella, and Fritz B. Prinz, 2nd ed, John Wiley & Sons, New York.
10. Energy Storage Materials: S.Selladurai Proceedings, 2010
11. Practical Photovoltaics: Electricity from Solar Cells, 3rd Ed.Richard J. Komp, Aatec Publications, Ann Arbor, MI, 2002

PAPER – 3(k) : LASERS AND APPLICATIONS

Preamble: To facilitates the students with theoretical aspects of laser theory and its applications. To provide the knowledge on laser theory, resonators and switching theory, gas & liquid lasers, solid state & semiconductor lasers and their applications.

Unit – I: Laser Theory (12 hrs)

Absorption - Spontaneous and stimulated emission - Einstein's coefficients - threshold conditions for laser action - Line broadening, Mechanism - Lorentzian and Doppler line shapes - Small signal gain - Gain coefficient - gain saturation - Rate equations for 3 and 4 level systems.

Unit – II: Resonators and Switching Theory (12 hrs)

Resonant cavity - Fox and Li - Boyd and Gorden's theory on resonators - modes - Spot size - Types of resonators - Mode selection - Q switching theory and technique - Mode locking theory and technique.

Unit – III: Gas and Liquid Lasers (12 hrs)

He-Ne, Argon Ion, Carbon dioxide, Nitrogen - Metal vapour - Gas dynamics - Excimer - Free electron lasers - Dye lasers organic dyes - Pulsed and CW dye lasers - Threshold conditions - Puming configurations.

Unit – IV: Solid State And Semiconductor Lasers (12 hrs)

Ruby, Nd : YAG, Nd : Glass, Ti-sapphire, Alexandrite, lasers - Semiconductor lasers - Homo function - Hetro function - Quantum well laser.

Unit – V: Applications (12 hrs)

Speckle, speckle interferometry - Holography - Holographic interferometry - Material processing - Surface treatment - welding, drilling - Laser ranging - Laser Doppler Velocimetry - Pollution monitoring - Medical applications.

REFERENCES

1. Laser Fundamentals, William T. Silfvast, Cambridge University Press, 1999.
2. Oshea, Callen and Rhcdes, "An Introduction to Lasers and their Applications", Addison Wesley, 1985.
3. A.Yariv, "Quantum Electronics", Third Edn., Addison-Wesley 1990.
4. Hariharan, "Optical Holography", Academic Press, New York, 1983.
5. Erf.R.K."Speckle Metrology", Academic Press, New York, 1978.

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List of papers for the Ph.D. course work in Physics

S. No.	Courses
1	Materials Science
2	Nanomaterials
3	Space Physics
4	Crystal Growth
5	Thin film
6	Electronic structure calculation
7	Non linear dynamics
8	Medical Physics
9	Radiation Physics
10	Alternative energy conversion devices
11	Lasers and applications

S. No.	Online courses - NPTL
12	Advanced materials and processes
13	Introduction to nonlinear optics and its applications
14	Non-conventional energy resources
15	Design of photo-voltaic systems

S. No.	Courses
16	Research and Teaching Methodology
17	Advanced Physics
18	Mini Project

Paper - 1: MATERIALS SCIENCE

Preamble: To expose the students with theoretical aspects of materials science. To provide the knowledge about phase diagrams, mechanical properties, ceramics, polymers, plastics and crystals.

Unit – I: Phase Diagrams

(12 hrs)

Solid solutions and intermediate phases – Equilibrium phase diagrams, Cu-Ni, Pb-Sn, Al-Cu system phase diagrams – Free energy and equilibrium phase diagrams – Nucleation and growth – Martensitic transformation – Strengthening mechanisms – Iron-Carbon system – Alloy steels – Aluminium-Copper system – Copper-Zinc system – Corrosion

Unit - II: Mechanical Properties

(12 hrs)

Stress- Strain curve – Elastic deformation: Characteristics, Atomic mechanism, Shear stress, Bulk modulus, Strain energy, Strain deformation – Viscous deformation: Spring-Dashpot models – Anelastic and Viscoelastic deformation: Viscoelastic models – Plastic deformation: Dislocations and Stress-strain curves, Plasticity theory – Fracture: Ideal fracture, Brittle fracture, Fracture mechanics, Cohesive models, Ductile fracture – Mechanical testing

Unit - III: Ceramics

(12 hrs)

Structure of ceramics – Production of ceramics: Raw materials, Forming and Post-forming processes – Production of glass: Melting of glass, Glass forming and annealing – Mechanical properties of ceramics – Wear and erosion resistance – Thermal shock – Silica-Alumina system – Commercial systems: Zirconia, Sialones, Cement and Concrete

Unit - IV: Polymers and Plastics

(12 hrs)

Molecular structure: Monomers & Polymers, Synthesis, Molecular weight measurement, Branching & Tacticity, Copolymers and blend – Mechanics of polymer chain: Freely jointed chains, Entanglements, Rubber elasticity – Thermoplastic melts: Viscosity, Shear thinning, Processing, Extrusion – Amorphous polymers: Solidification, glass transition, Various models – Crystalline polymers – Crosslinked polymers: Elastomers, Thermosets – Liquid crystal polymers – Mechanical properties: Stress-Strain behaviour – Chemical properties

Unit - V: Crystals

(12 hrs)

Crystal growth from solution – Melt growth techniques: Bridgman method, Czochralski crystal pulling technique, Crystal growth from Vapour phase – Crystal Imperfections – Point defects: Vacancies, interstitials, Impurities, electronic defects – Line defects: Edge dislocation, Screw dislocation – Surface defects: Grain boundaries, Tilt boundaries, Twin boundaries, Stacking faults, Ferromagnetic domain walls – Volume defects: Cracks, Voids

Books for Study and References

1. J.C.Anderson, K.D.Lever, P. Leever and R.D.Rowlings, Materials Science for Engineers, Nelson Thomas Ltd, First Indian reprint, 2010
2. M.Arumugam, Materials Science, Anuradha Agencies, Publishers, Second Edition, Fifth Reprint, 2005
3. R,Balasubramaniam, Materials Science and Engineering, Wiley India (P) Ltd, 2010
4. V.Raghavan, Materials Science for Engineering, Prentice Hall of India Pvt Ltd, 2006

Paper - 2: NANOMATERIALS

Preamble: To felicitates the knowledge on nanomaterials. To make the students understanding the fundamental aspects of nanomaterials, synthesis, nanostructures, properties and characterization techniques

Unit-I: Synthesis (12 hrs)

Sol-Gel and Precipitation technologies - Ball milling - RF plasma - Combustion Flame - Chemical Vapor Condensation process – Electrodeposition - Laser synthesis - Gas phase condensation - Sonochemical.

Unit-II: Nanostructures (12 hrs)

Preparation of quantum nanostructures: Preparation - Size and Dimensionality Effects – Excitations - Single-Electron Tunneling - Applications. Nanomachines and Nano devices: Micoelectrochemical systems – Nano electrochemical systems - Molecular and Super molecular switches.

Unit-III: Properties (12 hrs)

Properties of Individual Nanoparticles: Metal Nanoclusters – Semiconducting Nanoparticles - Rare Gas and Molecular clusters. Bulk Nanostructured Materials: Solid disordered Nanostructure - Nanostructured crystals.

Unit - IV: Characterization Techniques (12 hrs)

Structural: Powder XRD & particle size determination, Neutron diffraction; Spectroscopic: X-ray Photoelectron (XPS), Photoluminescence, Impedance and Energy Dispersive X-ray (EDAX) spectroscopy.

Unit - V: Characterization Techniques (12 hrs)

Thermal: Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC); Microscopic: Atomic Force Microscopy (AFM); Electrical and Magnetic: Four - probe method, Vibrating sample Magnetometer.

Books for Study and Reference

1. Evgenij Barsoukov and J. Ross Macdonald : Impedance Spectroscopy : Theory, Experiment and Applications, (John Wiley & Sons, Inc., Hoboken, New Jersey, second edition), 2005.
2. G. Cao: Nanostructures & Nanomaterials: Synthesis, Properties & Applications, (Imperial College Press), 2004.
3. Koch CC, Nanostructured Materials processing, properties and potential applications, Williams Andrew Publishing, Noyes, 2002
4. Pavia, Lampman, Kriz and Vyvyan, Spectroscopy, Cengage Learning India Pvt Ltd., 2011.
5. Willard, Merritt, Dean and Settle, Instrumental Methods of Analysis. CBS Publishers & Distributors, Delhi, 1986.
6. J.Ross Mcdonald, Impedance Spectroscopy Emphasizing solid materials and systems, John Wiley & sons, New York, 1996.
7. T. Pradeep, NANO: The Essentials, Tata Mc Graw-Hill Pvt. Ltd., New Delhi, 2007.
8. Charles P. Poole Jr & Frank J. Owens, Introduction to Nanotechnology, John Wiley & Sons (Asia) Pvt. Ltd., New Delhi, 2006.
9. Jackie Y.Ying, Nanostructured Materials, Academic Press, USA, 2001.

Paper – 3: SPACE PHYSICS

Preamble: To enlighten the students with the concepts of space physics. To make the students understanding the concepts of remote sensing of earth's climate system, space and plasma physics, space weather, introduction to magneto hydrodynamics, x-ray astronomy

Unit – I: Remote Sensing of Earth's Climate System (12 hrs)

Remote sensing of earth's climate system- requirements for remote sensing of climate system- methodology- constrains- basic concept of remote sensing- surface factors- atmospheric factors- instrumental factors- using reflected sunlight- global vegetation remote sensing- using thermal emission- global sea surface temperature measurement- radar altimetry- surface effects- atmospheric effects- ocean and ice monitoring by radar altimetry.

Unit - II: Space and Plasma Physics (12 hrs)

Basic plasma physics- principle- application- space plasma- the frozen in-flux-MHD plasma waves- solar wind and IMF- collision less shocks- bow shocks- shock jumps- shock structure- shock acceleration- magnetic reconnection- terrestrial magnetosphere- closed, open and flux transfer events- storms , sub storms- solar wind interaction with ionosphere- planets- insulator bodies(moon)- comets.

Unit – III: Space Weather (12 hrs)

Space weather- structure of sun- solar cycle- solar activity- coronal heating. The solar wind- wind- Aurora- Auroral sub storms- co-rotating interaction region(CIR)- solar flares- the ionosphere- solar energetic particle events(SEP)- coronal mass ejections(CME) and geomagnetic storms- Halo CME's- interplanetary CME's- magnetic clouds.

Unit - IV: Introduction to Magneto Hydrodynamics (12 Hrs)

Maxwell's equations in MHD- magnetic Reynold's number- Alfven speed- plasma beta parameter- force free magnetic field- magnetic buoyancy- magneto ststic equilibrium- magnetic reconnection- current sheet- acoustic waves- Alfven waves compressional Alfven waves- magneto acoustic waves- inertial waves.

Unit – V: X-Ray Astronomy (12 hrs)

Origin of X-rays astronomy- X-ray binaries- black hole- neutron stars- pulsars- white dwarfs- clusters of galaxies.

Books for Study and References

1. Thomas E Cravens, Physics of Solar System Plasma, (Cambridge University Press), 1997.
2. Thomas I Gombosi, Physics for Space Environment, (Cambridge University Press), 2004.
3. Louise K Hara and Keith O Mason, Space Science, (University of London, World Scientific Publishing Co.), 2004.
4. Margaret G Kivelson and Christopher T Russell, Introduction to Space Physics, (Cambridge University Press), 1995.

Paper – 4 : CRYSTAL GROWTH

Preamble: To introduce the knowledge on crystal growth and characterization. To expose the students with theories of nucleation & crystal growth, crystal growth from various techniques such as, solution, melt and vapour phase and their characterization.

Unit – I: Fundamentals of Crystal Growth (12 hrs)

Importance of crystal growth – Classification of crystal growth methods – Basic steps: Generation, transport and adsorption of growth reactants – Nucleation: Kinds of nucleation – Classical theory of nucleation: Gibbs Thomson equations for vapour and solution – Kinetic theory of nucleation – Becker and Doring concept on nucleation rate – Energy of formation of a spherical nucleus – Statistical theory on nucleation: Equilibrium concentration of critical nuclei, Free energy of formation.

Unit – II: Theories of Crystal Growth (12 hrs)

An introductory note to Surface energy theory, Diffusion theory and Adsorption layer theory – Concepts of Volmer theory, Bravais theory, Kossel theory and Stranski's treatment – Two-dimensional nucleation theory: Free energy of formation, Possible shapes and Rate of nucleation – Mononuclear, Polynuclear and Birth and Spread models – Modified Birth and Spread model – Crystal growth by mass transfer processes: Burton, Cabrera and Frank (BCF) bulk diffusion model, Surface diffusion growth theory.

Unit – III: Experimental Crystal Growth-Part-I: Melt Growth Techniques (12 hrs)

Basics of melt growth – Heat and mass transfer – Conservative growth processes: Bridgman-Stockbarger method – Czochralski pulling method – Kyropoulos method – Non-conservative processes: Zone-refining – Vertical and horizontal float zone methods – Skull melting method – Vernueil flame fusion method.

Unit – IV: Experimental Crystal Growth-Part-II: Solution Growth Techniques (12 hrs)

Growth from low temperature solutions: Selection of solvents and solubility – Meir's solubility diagram – Saturation and supersaturation – Metastable zone width – Growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods– Crystal growth in Gel media: Chemical reaction and solubility reduction methods – Growth from high temperature solutions: Flux growth Principles of flux method – Choice of flux – Growth by slow evaporation and slow cooling methods – Hydrothermal growth method.

Unit – V: Experimental Crystal Growth-Part-III: Vapour Growth Techniques (12 hrs)

Basic principles – Physical Vapour Deposition (PVD): Vapour phase crystallization in a closed system – Gas flow crystallization – Chemical Vapour Deposition (CVD): Advantageous and disadvantageous – Growth by chemical vapour transport reaction: Transporting agents, Sealed capsule method, Open flow systems – Temperature variation method: Stationary temperature profile, Linearly time varying temperature profile and Oscillatory temperature profile.

Books for Study and Reference

1. 'Crystal Growth Processes' by J.C. Brice, 1986, John Wiley and Sons, New York.
2. 'Crystallization' by J.W. Mullin, 2004, Elsevier Butterworth-Heinemann, London.
3. 'Crystal Growth: Principles and Progress' by A.W. Vere, 1987, Plenum Press, New York.
4. 'Crystals: Growth, Morphology and Perfection' by Ichiro Sunagawa, 2005, Cambridge University Press, Cambridge.
5. 'Crystal Growth' by B.R. Pamplin, 1975, Pergamon Press, Oxford.

PAPER – 5: Thin film

Preamble: To expose the students with knowledge of understanding the basic preparation and to get knowledge about the various properties of thin films. To make the understand the preparation and various necessary techniques used for analyzing the thin films

Unit- I: Preparation of Thin Films (12 hrs)

Spray pyrolytic process – characteristic feature of the spray pyrolytic process – ion plating – Vacuum evaporation – Evaporation theory – The construction and use of vapour sources – sputtering Methods of sputtering – Reactive sputtering – RF sputtering - DC planar m magnetron sputtering .

Unit - II: (Thickness Measurement and Nucleation and Growth in Thin Film (12 hrs)

Thickness measurement: electrical methods – optical interference methods – multiple beam interferometry – Fizeau – FECO methods – Quartz crystal thickness monitor. Theories of thin film nucleation – Four stages of film growth incorporation of defects during growth.

Unit - III: Electrical Properties of Metallic Thin Films (12 hrs)

Sources of resistivity in metallic conductors – sheet resistance - Temperature coefficient of resistance (TCR) – influence of thickness on resistivity – Hall effect and magneto resistance – Annealing – Agglomeration and oxidation.

Unit - IV: Transport Properties of Semiconducting and Insulating Films (12 hrs)

Semiconducting films ; Theoretical considerations - Experimental results – Photoconduction – Field effect thin films – transistors, Insulation films Dielectric properties – dielectric losses – Ohmic contacts – Metal – Insulator and Metal – metal contacts – DC and AC conduction mechanism

Unit - V: Optical Properties of Thin Films and Thin Films Solar Cells (12 hrs)

Thin films optics –Theory – Optical constants of thin films – Experimental techniques – Multilayer optical system – interference filters – Antireflection coating ,Thin films solar cells : Role, Progress , and production of thin solar cells – Photovoltaic parameter, Thin film silicon (Poly crystalline) solar cells : current status of bulk silicon solar cells – Fabrication technology – Photo voltaic performance : Emerging solar cells : GaAs and CuInSe.

Books for study and reference

1. Hand book of Thin films Technology: L I Maissel and R Clang .
2. Thin film Phenomena : K L Chopra .
3. Physics of thin films, vol. 12 , Ed George Hass and others .
4. Thin films solar cells – K L Chopra and S R Das .
5. Thin films processes – J L vilsan
6. vacuum deposition of thin films – L Holland .
7. The use of thin films in physical investigation – J C Anderson.
8. Thin films technology – Berry, Koil and Harri

PAPER – 6: ELECTRONIC STRUCTURE CALCULATION

Preamble: To introduce knowledge on electronic structure calculation. To make the students to understand basic concepts, various analysis on natural bond Orbitals, normal coordinates and different experimental methods

Unit – I: FTIR Raman Spectra (12 hrs)

Normal modes of vibration – Group frequencies – Origin of Infrared and Raman spectra – Infrared and Raman activity – IR and Raman spectral characteristics – FTIR and Raman spectra and their interpretation – Factors affecting Vibrational spectra - Hydrogen bonding – Structure elucidation using IR and Raman spectra – Resonance Raman scattering – Vibrational spectra of aromatic molecules

Unit – II: Quantum Chemical Computation (12 hrs)

Molecular Orbital Theory - Basis set – Electronic structure methods – Semi empirical methods – *Ab initio* methods - density functional theory methods - Z-matrix – geometry optimization – Harmonic Vibrational analysis – Atoms in molecules charges and Bond order – Potential energy surface – Mulliken population analysis – Vibrational circular dichroism intensities – Software: MOPAC, Gaussian

Unit – III: Natural Bond Orbital Analysis (12 hrs)

Natural bond orbitals and one-particle density matrix – Atomic eigenvectors – Natural atomic orbitals and natural population analysis – Bond eigenvectors – natural hybrids and natural bond orbitals – Natural localized molecular orbitals – Hyperconjugative interaction in NBO analysis.

Unit – IV: Normal Coordinate Analysis (12 hrs)

Classical theory of molecular vibrations – Construction of force constant matrix F – Internal coordinates in force field calculations – Theory of lattice vibrations – Scale factor calculation – Intensity calculation – Natural internal coordinates – MOLVIB software: General structure input data – Control parameters

Unit – V: Experimental Techniques (12 hrs)

IR spectrometer instrumentation – IR sources – Sample handling techniques – IR detectors – FTIR spectrometer – FTIR Raman spectrometer – Sample handling techniques – Laser exciting sources – Raman detectors – SERS techniques.

BOOKS FOR REFERENCE

1. Brain Smith, Infrared Spectral Interpretation – A Systematic Approach , CRC Press, New York, (1999)
2. G.Aruldas, Molecular structure and spectroscopy, prentice-Hall of India (P) Ltd., New Delhi-1110001, (2001).
3. G.Socrates, Infrared characteristic group frequencies, John Wiley & Sons, New York, (1980)
4. Ira N.Levine, Quantum chemistry V Ed., Prentice Hall International, Inc., London (2003).
5. Alan E. Reed et al., Chem. Rev. 88 (1988) 899-906.
6. Tom Sundius, MOLVIB User's guide Ver. 2, Helsinki (June 2002)
7. Robert M. Silverstein et al., Spectrometric identification of organic compounds, John Wiley & Sons, Inc., New York, (2003).

PAPER – 7: NONLINEAR DYNAMICS

Preamble: To understand the basic concepts of nonlinear dynamics. This course provides knowledge about the effects of nonlinearity on dynamical systems

Unit – I: Nonlinearity, linear and nonlinear oscillators (12 hrs)

Dynamical systems - linear and nonlinear forces - Mathematical implications of nonlinearity - Working definition of nonlinearity - Effects of nonlinearity-Linear oscillators and predictability - Damped and driven nonlinear oscillators.

Unit – II: Equilibrium points, bifurcations and chaos (12 hrs)

Equilibrium points - General criteria for stability – Classification - Some simple bifurcations - Saddle node, pitch fork, transcritical and Hopf bifurcations - Discrete dynamical systems - Logistic map - Equilibrium points and their stability - period doubling phenomenon - chaos.

Unit – III: Chaos in nonlinear electronic circuits (12 hrs)

Linear and nonlinear circuit elements - nonlinear circuits - Chua's diode - Autonomous case - Bifurcations and chaos - Chaotic dynamics of MLC circuit-Analogue circuit simulation - Some other useful nonlinear circuit - Colpitt's oscillator.

Unit – IV: Fractals (12 hrs)

Self similarity - Properties and examples of fractals - Fractal dimension - Construction and properties of some fractals-Middle one third cantor set-Koch curve - Sierpinski triangle-Julia set - Mandelbrot set - Applications of fractals.

Unit – V: Solitons (12 hrs)

Linear waves - Linear non dispersive wave propagation - Linear dispersive wave propagation - Nonlinear dispersive systems - Korteweg de vries equation - solitary and cnoidal waves - Numerical experiments of Zabusky and Kruskal - birth of solitons - Properties of solitons - applications of solitons.

Book For Study:

Nonlinear dynamics, Integrability, Chaos, Patterns, M. Lakshmanan and S.Rajasekar, Springer, Berlin, 2003.

Books for Reference:

1. Chaos in nonlinear oscillator, controlling and synchronization, M.Lakshmanan and K.Murali (World Scientific, Singapor,1997.)
2. Deterministic chaos, H.G.Schuster, (Verlag,Weinheim,1998.)

PAPER – 8: MEDICAL PHYSICS

Preamble: To study the basic concepts of medical physics. To make the students to understanding the concepts of Physics in lungs and breathing, sound in medicine, light in medicine, physics of diagnostic X-rays and cardio vascular systems.

Unit - I: The Physics of the Lungs and Breathing (12 hrs)

The Airways– How the blood interact – Measurement of Lung Volumes – Pressure, Airflow, Volume Relationships of the Lungs – Physics of the Alveoli – The Breathing Mechanism – Airway Resistance – work of Breathing – Physics of some common Lung Diseases. Electricity within the Body: Electric signals – from the Heart (Electro Cardiogram) – From the Brain (Electro encephalogram) – From the Eye (Electro retinogram and electrooculogram) – Magnetic signals from Heart and Brain (Magnetocardiogram and Magnetoencephalogram) – Current Research involving electricity in the body.

Unit – II: Sound in Medicine (12 hrs)

General properties of sound, the body as a drum (percussion in medicine) – The stethoscope – ultrasound pictures of the body – ultrasound to measure motion – physiological effects of ultrasound in therapy – the production of speech – Physics of the ear and hearing : The outer ear – the middle ear – the inner ear – sensitivity of the ears – testing your hearing – deafness and hearing aids

Unit – III: Light in Medicine (12 hrs)

Measurement of light and its units – applications of visible light in medicine – applications of ultraviolet and infrared light in medicine – Lasers in Medicine applications of microscopes in medicine – Physics of eye and vision: Focusing elements of the eye – some other elements of the eye – the retina – the light detector of the eye – how sharp are your eye? Optical illusions and related phenomena – defective vision and its correction – colour vision and chromatic aberration – instruments used in ophthalmology.

Unit – IV: Physics of Diagnostic X-Rays (12 hrs)

Production of X-ray beam – how X-ray are absorbed – making an X-ray image – radiation to patients from X-rays – producing live X-ray images – fluoroscopy – X-ray slices of the body – radiographs taken without film Physics of Radiation Therapy: The dose units used in radiotherapy – the red and the gray – principles of radiation therapy – a short course in radiotherapy planning – megavoltage therapy – short distance radiotherapy or brachytherapy other radiation sources – closing thought of radiotherapy.

Unit – V: Physics of the Cardiovascular System (12 hrs)

Major Components of the Cardiovascular system – O₂ and CO₂ Exchange in the Capillary system – Work done by the Heart – Blood pressure and its measurement Transmural Pressure– Bernoulli's Principle – Blood flow – Heart Sounds – Cardiovascular Diseases – Functions of Blood Cardiovascular Instrumentation: Biopotentials of the Heart – Electrodes – Amplifiers – Patient Monitoring – Defibrillators – Pacemakers

BOOK FOR STUDY

Medical Physics–John R.Cameron & James G.Skofronick (John Wiley&Sons, New York1978)

PAPER – 9: RADIATION PHYSICS

Preamble: To teach the students about the basic concepts of radiation physics. To impart knowledge on radiation and interaction, principles of radiation detection and measurement, radiation therapy techniques, diagnostic radiology and radiation protection.

Unit-I: Radiation and Interactions

(12 hrs)

Interaction of Electromagnetic radiation with matter – Photoelectric and Compton process – pair production – interaction of particles with matter – neutrons – heavy ions – nuclear reactions and production of radioisotopes – radiation sources – natural and artificial radio active for medical applications – Bethe- Bloch formula.

Unit – II: Principles of Radiation Detection and Measurement

(12 hrs)

Radiation units and definitions – G.M. Counter – Scintillation detectors – Solid state detectors – Photofilm method - Pocket dosimeter – TLD - FBX dosimeters.

Unit – III: Radio Therapy Techniques

(12 hrs)

Telegamma unit – accelerators for therapy – Iridium and cobalt needles – preparation of tracers and labeled compound – uses of radioisotopes (Gamma and beta) in brachytherapy. Dosimetry in medical applications – beta particles dose computation for biological models – dosimetry of internally administered isotopes Principles and overview of conformal radiotherapy, SRS, SRT and IMRT.

Unit – IV: Diagnostic Radiology

(12 hrs)

The physical basis of diagnostic radiology – the diagnostic X-ray tube – electrical circuits – rating of the x-ray unit – factors on which quality and quantity of x-ray production depends – geometric factor which influences the radiographic image – fluoroscopy – tomography – radio isotopes in clinical medicine – rectilinear scanner – gamma camera.

Unit – V: Radiation Protection

(12 hrs)

Philosophy behind radiation protection – basic concepts of MPD – recent ICRP recommendations – tissues at risk – risk factor – evaluation of internal and external radiation hazards – transport and waste disposal of radioactive materials.

REFERENCES

1. Meredith and Massay. "Fundamental Physics of Radiology", John Wright & Sons Jones M.E. and Cunningham J, "Physics of Radiology", Charles C. Thomas, USA, 1984.
2. Knoll, "Radiation Detection and Measurement", John Wiley and Sons, New York, 1982.
3. Mould R.F, "Radiation Protection", Adam Hilger's Boston, 1985.
4. Govindarajan K.N, "Advanced Medical Radiation Dosimetry", Prentice Hall of India, New Delhi, 1992

PAPER- 10: ALTERNATIVE ENERGY CONVERSION DEVICES

Preamble: To introduce knowledge on alternative energy sources. To introduce the importance and overview of alternate energy sources. To make the students learn the basics of various energy conversion devices

Unit – I: Introduction and Overview of Alternative Energy Sources and Utilization (12 hrs)

Global energy budget – origins of fossil fuels – Principles of energy conversion: thermodynamic first and second laws – the Carnot cycle – Solar energy: Solar intensity and spectrum – global solar energy potential and current level of utilization – Photovoltaic: history – principles and theoretical limits – Solar cells and modules – semiconductor materials – single and multiple layer p-n junction diodes – Solar cells and modules – maximum power output – energy efficiency – quantum efficiency – Solar cells: characterization and modeling – Photovoltaic utilization.

Unit – II: Fundamentals of Electrochemistry and Electrode Kinetics (12 hrs)

Charge transfer reaction and reaction kinetics – Third-generation solar cells: dye-sensitized photocell – organic/polymer solar cell-Fuel cells: overview of types – basic operation and performance – Fuel cells: catalysis – Fuel cells: charge and mass transport – PEM fuel cells' Molten carbonate fuel cells – Solid oxide fuel cells – Overview of fuel cell systems: fuel-cell stack and thermal management.

Unit – III: Hydrogen as a Renewable Energy Source (12 hrs)

Sources of Hydrogen, Fuel cell – Principle of working – construction and applications – Fuel for Vehicles – Hydrogen Production: Direct electrolysis of water, thermal decomposition of water, biological and biochemical methods of hydrogen production – Storage of Hydrogen: Gaseous, Cryogenic and Metal hydride – Environmental impact.

Unit – IV: Batteries (12 hrs)

Primary and Secondary batteries - principles and application – Lithium batteries, Lithium ion and polymer batteries. Super-capacitors: principles and working, electrode materials synthesis process, fabrication of the devices and their applications.

Unit – V: Biomass Utilization (12 hrs)

Biodiesel and ethanol, Biomass utilization, Nuclear Energy: Potential of Nuclear Energy, International Nuclear Energy Policies and Regulations. Nuclear Energy Technologies – Fuel enrichment, Different Types of Nuclear Reactors, Nuclear Waste Disposal, and Nuclear Fusion.

REFERENCES:

1. Renewable Sources of Energy and Conversion Systems: N.K.Bansal and M.K.Kleman.
2. Principles of Thermal Process : Duffie -Beckman
3. Solar Energy Handbook: Kreith and Kreider (McGrawHill)
4. Solar Cell : Marteen A. Green
5. Solar Hydrogen Energy Systems -T. Ohta (Ed.) (Pergamon Press)
6. Hydrogen Technology for Energy – D.A.Maths (Noyes Data Corp.)
7. Handbook : Batteries and Fuel cell – Linden (Mc.Graw Hill)
8. Batteries Volume (I) and (II) – Collins
9. Fuel Cell Fundamentals :O'Hayre, Suk-Won Cha, Whitney Colella, and Fritz B. Prinz, 2nd ed, John Wiley & Sons, New York.
10. Energy Storage Materials: S.Selladurai Proceedings, 2010
11. Practical Photovoltaics: Electricity from Solar Cells, 3rd Ed.Richard J. Komp, Aatec Publications, Ann Arbor, MI, 2002

PAPER – 11 : LASERS AND APPLICATIONS

Preamble: To facilitates the students with theoretical aspects of laser theory and its applications. To provide the knowledge on laser theory, resonators and switching theory, gas & liquid lasers, solid state & semiconductor lasers and their applications.

Unit – I: Laser Theory (12 hrs)

Absorption - Spontaneous and stimulated emission - Einstein's coefficients - threshold conditions for laser action - Line broadening, Mechanism - Lorentzian and Doppler line shapes - Small signal gain - Gain coefficient - gain saturation - Rate equations for 3 and 4 level systems.

Unit – II: Resonators and Switching Theory (12 hrs)

Resonant cavity - Fox and Li - Boyd and Gorden's theory on resonators - modes - Spot size - Types of resonators - Mode selection - Q switching theory and technique - Mode locking theory and technique.

Unit – III: Gas and Liquid Lasers (12 hrs)

He-Ne, Argon Ion, Carbon dioxide, Nitrogen - Metal vapour - Gas dynamics - Excimer - Free electron lasers - Dye lasers organic dyes - Pulsed and CW dye lasers - Threshold conditions - Pumping configurations.

Unit – IV: Solid State And Semiconductor Lasers (12 hrs)

Ruby, Nd : YAG, Nd : Glass, Ti-sapphire, Alexandrite, lasers - Semiconductor lasers - Homo function - Hetro function - Quantum well laser.

Unit – V: Applications (12 hrs)

Speckle, speckle interferometry - Holography - Holographic interferometry - Material processing - Surface treatment - welding, drilling - Laser ranging - Laser Doppler Velocimetry - Pollution monitoring - Medical applications.

REFERENCES

1. Laser Fundamentals, William T. Silfvast, Cambridge University Press, 1999.
2. Oshea, Callen and Rhcdes, "An Introduction to Lasers and their Applications", Addison Wesley, 1985.
3. A.Yariv, "Quantum Electronics", Third Edn., Addison-Wesley 1990.
4. Hariharan, "Optical Holography", Academic Press, New York, 1983.
5. Erf.R.K."Speckle Metrology", Academic Press, New York, 1978.

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

B.Sc.CHEMISTRY (Affiliated Colleges)

LEARNING OUTCOME BASED CURRICULUM

(For those who joined from 2021-2022 onwards)

VISION AND MISSION OF THE UNIVERSITY

VISION

" To provide quality education to reach the unreached "

MISSION

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled

VISION AND MISSION OF DEPARTMENT

VISION

To make the students excel in the fields of education, fundamental and advanced research in Chemistry by providing quality education so that they can compete and contribute to the varying *technology*.

MISSION

1. To teach the students to analyze problems ranging from the basics of Chemistry to advanced level.
2. To give the students adequate hands on experience to work in applied fields.

3. To train the students to act as a useful member or effective leader of a team in multidisciplinary setting.

PREAMBLE

The B.Sc Chemistry programme is fundamental to the revolution taking place in Science and Technology. The aim of the programme is to impart basic skills and knowledge on the principles of all branches of Chemistry to cater to need of Society, Scientific Organization and Industries in the context of developing needs of our country by providing extensive coverage on the fundamental aspects of chemistry relating applications of chemistry to life systems. This course provides intensive practical training to develop associate and apply various aspects of chemistry in day to day life .The programme prepares the students to achieve success in competitive examinations and make developments of needs of their life.

Eligibility for the B.Sc Chemistry Programme

B.Sc Chemistry is a three year Undergraduate course which one can apply after completing 12th from science stream. Eligibility for the course says that the interested must have science with subjects as Physics, Chemistry, Mathematics, Biology or Computer Science as their main subjects from any recognized board.

PROGRAMME STRUCTURE

SEM	Part	SUB. No	SUBJECT STATUS	SUBJECT TITLE	contact hrs /wk	L hrs /wk	P hrs /wk	credits
I	I	1	Language	Tamil/Other Languages	6	6	0	4
	II	2	Language	Communicative English – I	6	6	0	4
	III	3	Core I	Inorganic Chemistry – I	4	4	0	4
	III	4	Core II	Professional English for Physical Science –I	4	4	0	4
	III	5	Major Practical I	Inorganic quantitative (Volumetric) Analysis – I	2	0	2	2
	III	6	Allied Course I	Allied Chemistry – I	4	4	0	3
	III	7	Allied Practical I	Allied Chemistry Practical- I	2	0	2	2
	IV	8	Common	Environmental Studies	2	2	0	2
				SUB TOTAL		30	26	4
II	I	9	Language	Tamil/Other Languages	6	6	0	4
	II	10	Language	Communicative English – II	6	6	0	4
	III	11	Core III	Organic Chemistry – I	4	4	0	4
	III	12	Core IV	Professional English for Physical Science-II	4	4	0	4
	III	13	Major Practical II	Inorganic quantitative (Volumetric)Analysis – II	2	0	2	2
	III	14	Allied Course II	Allied Chemistry – II	4	4	0	3
	III	15	Allied Practical-II	Allied Chemistry Practical- II	2	0	2	2
	IV	16	Common	Social Value Education	2	2	0	2
				SUB TOTAL		30	26	4

III	I	17	Language	Tamil/Other Languages	6	6	0	4
	II	18	Language	English	6	6	0	4
	III	19	Core V	Physical Chemistry – I	4	4	0	4
	III	20	Major Practical III	Organic Preparation & Inorganic Qualitative Analysis - I	2	0	2	2
	III	21	Allied Course II	Allied Chemistry – I	4	4	0	3
	III	22	Allied Practical II	Allied Chemistry Practical- I	2	0	2	2
	III	23	Skilled Based Course I	Green Chemistry/Food Chemistry	4	4	0	4
	IV	24	Non-Major Elective I	Food Science /Water Management	2	2	0	2
	IV	25	Common	Yoga	2	2	0	2
			SUBTOTAL	30+2	26+2	4	27	
IV	I	26	Language	Tamil/Other Languages	6	6	0	4
	II	27	Language	English	6	6	0	4
	III	28	Core VI	Inorganic Chemistry – II	4	4	0	4
	III	29	Major Practical IV	Inorganic Qualitative Analysis – II	2	0	2	2
	III	30	Allied Course II	Allied Chemistry – II	4	4	0	3
	III	31	Allied Practical II	Allied Chemistry Practical- II	2	0	2	2
	IV	32	Skilled Based Course II	Pharmaceutical chemistry/ Industrial Chemistry	4	4	0	4
IV	33	Non-Major Elective II	Dairy Chemistry / Chemistry in Everyday life	2	2	0	2	
IV	34	Common	Computers for Digital Era	2	2	0	2	
V	35	Extension Activity	NCC/NSS/YRC/YWF	-	-	-	1	
			SUBTOTAL	30+2	26+2	4	28	
III	36	Core VII	Organic Chemistry – II	6	6	0	4	

V	III	37	Core VIII	Physical Chemistry – II	6	6	0	4
	III	38	Major Elective I	Polymer Chemistry / Bio Chemistry	4	4	0	4
	III	39	Major Elective II	Modern Instrumental Analytical Techniques/ Applied Chemistry	4	4	0	4
	III	40	Major Practical V	Organic Analysis & Physical Constant Determination	8	0	8	4
	III	41	Major Practical VI	Gravimetric Estimation & Inorganic Preparation				
	IV	42	Skill Based Common	Personality Development / Effective Communication / Youth Leadership	2	2	0	2
	SUBTOTAL					30	22	08
VI	III	43	Core IX	Inorganic Chemistry – III	5	5	0	4
	III	44	Core X	Organic Chemistry - III	5	5	0	4
	III	45	Core XI	Physical Chemistry – III	5	5	0	4
	III	46	Major Elective III	Textile Chemistry / Nano Chemistry	4	4	0	4
	III	47	Major Practical VII	Physical Chemistry Experiments	4	0	4	2
	III	48	Major Project	Major Project	7		7	7
SUBTOTAL					30	19	11	25
GRANDTOTAL					180+4	145+4	35	152

Skill Based Course

One among the two given course will be selected.

Non-Major Elective

One among the two given course will be selected.

Major Elective

One among the two given course will be selected.

Major Project

Group Project –Maximum of five students per group

Extension Program for the Department

Apart from the curriculum, to enrich the skill development of the students following courses in

their premises are conducted.

Effective Communication

Personality development

Youth development

EVALUATION SCHEME

B.Sc Chemistry curriculum is divided and studied in six semesters. The internal assessments and external examination are the two parts of evaluation scheme. The external theory and practical examinations will be conducted by the university at end of each semester.

There is a separate passing minimum of 40% for the external and overall components.

Distribution of marks between Internal and External Assessment for Core, Skill Based, Non-Major Flective, Major Elective and Allied Courses.

★ Theory Marks 25 : 75

★ Practical Marks 50 : 50

Pass minimum of 40% for external and overall components.

1. Internal Assessment .

Internal Marks for **Theory** shall be allotted in the following manner

The average of the best two tests from three compulsory tests. Each test is of one hour duration	20 Marks
Assignment	05 Marks
Total	25 Marks

Distribution of marks between Internal and External Assessment
for skill based elective Course- 25 : 75

The average of the best two from three compulsory tests. Each test is of one hour duration	20 Marks
Assignment	05 Marks
Total	25 Marks

2. Internal Marks for **Practical** shall be allotted in the following manner

Experimental Work	25 Marks
Regularity	25 Marks
Total	50 Marks

3. Marks for **Major Project** shall be allotted in the following manner

InternalMarks : 50

External Marks: 50

Internal Marks for Project:

Components	Marks
Experimental work	25 Marks
Project report	25Marks
Total	50 Marks

External evaluation of Project

Project report evaluation and Viva-Voce will be conducted by both the External examiner and the Guide at the end of the semester.

4. The question pattern for all theory courses shall be as follows.

Duration of Exam: 3 Hours

Section	Type of questions	Mark
Part-A	Multiple choice question (Two question from each unit compulsory)	1×10=10 Marks
Part-B	Internal Choice questions (One question from each unit: either/or)	5×5=25 marks
Part-C	Internal Choice questions (One question from each unit: either/or)	8×5=40 marks
	Total	75 Marks

SEMESTER III
NON MAJOR ELECTIVE
FOOD SCIENCE

L	T	P	C
2	0	0	2

Course Objectives

- ✓ Learn the importance of food for energy.
- ✓ Know the needs of food additives & Spices.
- ✓ Know food preservatives.
- ✓ Study food adulterations and Quality of food standards.

UNIT I INTRODUCTION

Food : Sources and classification – Food as a source of energy - Functions and biological importance of Carbohydrates, Protein, Fat, Vitamins and Minerals - Calorific value of food – Energy requirements of individuals - Balanced diet-Glycemic index, Glycemic load.

UNIT II FOOD ADDITIVES AND SPICES

Definition, Food colourants : Natural and Artificial - Antioxidants, Sweetening agents, Stabilizers, Flavours, Bleaching and Maturing agents – Leavening agents. Chemistry of Spices.

UNIT III FOOD PRESERVATIVES

Definition – Principles of food Preservation - Classification - Methods of food preservation and Processing by heat, Cold, radiation, drying and deep freezing.

UNIT IV FOOD ADULTERATION

Definition – Types – Detection and Analysis of adulterants in foods: Milk, Chilli powder, Coffee powder, Turmeric powder, Ghee, Oil and Pulses.

UNIT V QUALITY STANDARDS

Quality control - Specification and Standards - FA, WHO standards – Packing and Labelling of foods, Essential Commodities Act - Consumer Protection Act - AGMARK.

Text books

1. B. Sivasankar Food Processing and Preservation, Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

2. M. Swaminathan Textbook on Food Chemistry, Printing and Publishing Co, Ltd, Bangalore 1993.

Reference Books:

1. L.M. Mayer, Food chemistry , CBS, ISBN-9788123911496.
2. Food Science , 3rd Edition, B. Sri Lakshmi New Age International Publisher, 2005.
3. Fundamentals of Foods and Nutrition – R. Mudambi. Sumathi, and M.V. Rajagopal, Willey Eastern Ltd, Madras.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Find the sources of food and list out major food groups	K1
CO2	Summarizes the food additives and explain its significance.	K2, K5
CO3	Explain the food preservation and functions of food preservatives	K5
CO4	Identify the adulterants available in the food.	K3
CO5	Examine the food and what are the food quality standards used to assess the food.	K5, K1

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs & PSOs:

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	M	M	S	M	S	L	L	M	L	S	M	S	L
CO 2	M	S	M	L	M	S	M	S	M	S	S	M	L
CO 3	S	M	S	M	L	S	L	M	M	S	S	M	M
CO 4	S	S	M	S	S	L	M	S	S	M	S	S	M
CO 5	S	S	L	S	M	S	L	L	M	L	M	M	M

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated

SEMESTER III
NON MAJOR ELECTIVE
WATER MANAGEMENT

L	T	P	C
2	0	0	2

Course Objectives

The main objectives of this course are to

1. Know the various sources of Water pollution.
2. Study Water Quality Parameters.
3. Learn Water Purification Process.
4. Gain Knowledge on Waste water.
5. Develop the methods for Water Storage.

UNIT I WATER POLLUTION

Definition-Sources of water pollution Types of water pollutants: Sewage and Domestic wastes, Industrial effluents, Agricultural discharges, Detergents, Pathogens, Pharmaceutical pollutants and Radioactive materials. Eutrophication and its effects.

UNIT II WATER QUALITY PARAMETERS

Physical, Chemical and Biological water quality parameters-Turbidity, Salinity-water quality standards for drinking water –BIS and WHO. Determination of pH, Total hardness, DO, BOD and COD.

UNIT III WATER PURIFICATION

Chemical coagulation, Flocculation, Sedimentation, Filtration and Disinfection - Desalination: reverse osmosis.

Purification of water for industrial purposes: Water softening- Permutit process and Ion-exchange process.

UNIT IV WASTE WATER TREATMENT

Elementary ideas of waste water treatment: Biological and Chemical processes- Pre-treatment-

Primary treatment-**Secondary treatment:** Aerobic and Anaerobic processes –**Tertiary treatment:** Evaporation Adsorption – Chemical precipitation.

UNIT V RESTORATION AND MANAGEMENT

Importance of lakes and rivers-Stresses on the Indian rivers and their effects –A restoration case

study: Ganga Action Plan: Objectives implementation and drawbacks. Rain water harvesting –Drip irrigation-Water recycling- The water Prevention and control of Pollution Act 1974.

Text books

1. A. K. De, Environmental Chemistry, Wiley Eastern Ltd., 3rd Edition, New Delhi,1994.
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut,2019.

Reference books

- 1.R. K. Trivedy and P. K. Goel, Chemical and biological methods for water pollution studies, Environmental Publications, Karad, India,2019
- 2.BIS 1991, Specification for drinking water, Bureau of Indian Standards, New Delhi
- 3.WHO 1992, International standards for drinking water, World Health Organisation, Geneva.
4. Industrial Chemistry , B.K.Sharma 2011.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Classify the water pollution and analyse the water pollutants	K2
CO2	List out different water quality parameters and discuss its importance.	K1
CO3	Elaborate water purification processes and show the advantages of different methods	K6
CO4	Apply various methods to treat waste water and analyze the treated water	K3
CO5	Develop the water storage methods	K3

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs & PSOs:

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	S	M	S	S	S	L	S	M	L	S	M	M
CO2	S	S	S	S	L	M	M	S	S	M	S	L	S
CO3	M	M	S	S	M	S	L	S	L	S	M	M	S
CO4	M	S	M	S	M	S	M	S	S	M	L	M	S
CO5	L	S	M	M	S	M	L	L	M	M	S	L	M

S – Strongly Correlated; M – Medium Correlated ; L – Low Correlated

SEMESTER IV
NON MAJOR ELECTIVE
DAIRY CHEMISTRY

L	T	P	C
2	0	0	2

Course Objective

The main objectives of this course are to

- Learn milk properties and its composition.
- Know the processing of milk.
- Know different products of milk.
- Acquire knowledge on milk products.
- Gain knowledge on condensed milk.

UNIT I PROPERTIES OF MILK

Milk Composition – Physico Chemical properties of milk – Animal, Feed and Environmental factors influencing the composition of milk – Milk lipids, Proteins, Sugar– Minerals and Vitamins in Milk – Thermal stability of Milk- Adulterants, Preservatives, and Neutralizer - examples and their detection.

UNIT II PROCESSING OF MILK

Destruction of microorganisms in milk – Physicochemical changes during processing – Boiling, Pasteurization – Pasteurization types – Bottle pasteurization –Batch pasteurization – HTST (High Temperature Short Time) – Vacuum pasteurization –(UHT) Ultra High Temperature Pasteurisation

UNIT II MILK PRODUCTS-I

Milk Products: Cream - Definition, Classification – Manufacturing - Chemistry of creaming process - Physico–chemical properties – Separation of cream, Estimation of fat in cream, Butter - Definition, Classification, Composition, Theory of churning, Desi butter, Salted butter. Ghee - major constituents, common adulterants and their detection.

UNIT IV MILK PRODUCTS-II

Fermented milk products - Fermentation of milk - Definition and Conditions. Ice creams - Definition, Composition, Types, Manufacture of Ice - Cream, Stabilizers, Emulsifiers and their role-Milk powder - Definition, Process of making milk Powder and Cheese.

UNIT V CONDENSED MILK

Condensed milk – Definition, Classification and Differences between Condensed milk and Skimmed milk– Sanitation - Pasteurization – Nutritive value of milk – Difference between cow milk and Buffalo milk- Milk enzymes.

Special milk - Definition and Advantages of sterilized milk, Flavoured milk, Standardized milk, Toned milk, Double toned milk.

Text Books

1. Applied Chemistry-K. Bagavathi Sundari, MJP, Publishers Chennai. 2006.
2. Principles of Dairy technology - Robert Jenness, John Wiley & Sons, Inc. New York 1959.

Reference Books :

1. Indian Dairy Products – K.S. Rangappa and K.T Acharya, Asia Publishing House, Bombay, India,1975.
2. Fundamentals of Dairy chemistry – N.P. Wong 3rd Edition,CBS Publishers 2001
3. Outlines of Dairy Technology - Sukumar De. – Oxford University Press Publishers 1996
4. Applied chemistry for home science & allied science - T.Jacob, Mcmillan India Ltd, NewDelhi,1979.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Identify the components in the milk and analyze the properties of milk.	K3, K4
CO2	Illustrate the processing of milk and Elaborate the changes in properties during processing	K2, K6
CO3	List out the milk products and determine the constituents in it	K1. K5
CO4	Explain the fermentation of milk and list out the fermented milk products.	K5, K1
CO5	Analyzed the condensed milk and Distinguish Cow and buffalo milk.	K4

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs & PSOs:

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	L	S	M	S	M	S	S	S	S	M	L
CO2	M	S	S	S	M	L	L	M	M	S	M	L	M
CO3	S	S	M	M	L	S	L	S	M	M	S	M	L
CO4	M	S	S	M	S	S	L	S	S	M	L	M	S
CO5	L	M	M	S	S	M	L	M	S	S	M	L	M

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated

SEMESTER IV
NON MAJOR ELECTIVE
CHEMISTRY IN EVERYDAY LIFE

L	T	P	C
2	0	0	2

Course Objectives

The primary objective of this course are to

- ❖ Study on the chemicals used in cosmetics.
- ❖ Know about soaps and detergents.
- ❖ Gain Knowledge on Nutrients.
- ❖ Understand the materials for agricultural chemistry.
- ❖ Know about the drugs.

UNIT I CHEMISTRY IN COSMETICS

Cosmetics – Definition, classification - Additives and its role in cosmetics–Perfumes
Cleansing cream, all-purpose cream, shampoos, deodorants - Antiperspirants - face powder - Compact powder, sunscreen lotion, skin colorant – lipstick. Cosmetic soaps - moisturizing soap and medicated soap. Dentifrices - toothpaste and mouth washers.

UNIT II CHEMISTRY IN THE LAUNDRY

Soaps - Basic chemical compositions of soaps, Surface active agents, builders, additives, fillers and fragrance, toilet soap, bathing bars, washing soaps. Bio-degradability. Detergents– Introduction, Detergent action, Significance of acidity and alkalinity. Common detergent chemicals.

UNIT III CHEMISTRY IN THE KITCHEN

Butter and cooking oil - saturated and unsaturated fatty acids, hydrogenation of oil. antioxidants and cholesterol. Chemistry of cooking - physical and chemical changes, stability of nutrients during cooking. Microwave cooking.

UNIT IV CHEMISTRY IN THE GARDEN

Food for plants, nutrient deficiencies in plants. Fertilizers, composting, pesticides and their toxicities. Insecticides, fungicides. Biological control of weeds and pests.

UNIT V CHEMISTRY IN TEXTILES

Fibres, yarns, and fabrics. Dyes and dyeing. Flammability. Carpet materials. Leather materials -

chemistry of tanning.

Text Books

- 1.Chemistry of Cosmetics, R.Kumar, Prestige Publishers, 2018.
- 2.Textbook of Fibres and Science and Technology,S.P.Mishra, NewAge International Pvt Ltd., 2000.
3. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2003.

Reference Book

- 1.TextBook of Herbal Cosmetics, M.Vimaladevi, CBS Publishers, 2019.
2. Introduction to textile Science – 3rd edition, Maryory L.Joshep
3. James A. Kent, Riegel’s Hand book of Industrial Chemistry, Springer Science, 2013

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Outline the daily used Cosmetics.	K2
CO2	List out the soaps and detergents and classify the soaps.	K1 K2
CO3	Explain about the nutrients from food materials.	K6
CO4	Discuss the fertilizers and pesticides necessary for the grow of plants.	K5
CO5	Distinguish fibres, yarns & Fabrics andIdentify the dyes used in dyeing.	K4 K3

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs & PSOs:

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	L	S	M	S	L	M	L	M	S	L	M
CO2	M	L	S	M	S	S	L	L	M	S	M	S	S
CO3	M	S	S	L	M	M	M	M	M	L	S	M	S
CO4	S	S	M	S	L	S	L	S	M	S	L	M	M
CO5	M	S	M	S	S	M	M	S	S	S	M	L	S

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated

SEMESTER V
MAJOR ELECTIVE I
POLYMER CHEMISTRY

L	T	P	C
4	0	0	4

Course Objectives

The primary objectives of this course are to

- ✓ Know types of polymer and molecular mass
- ✓ Acquire knowledge about the polymerization techniques.
- ✓ Know the details of organic and inorganic polymers.
- ✓ Understand the processing of polymer and polymer degradation.
- ✓ Familiarize about advances in polymers.

UNIT I INTRODUCTION TO POLYMERS AND MOLECULAR WEIGHT OF POLYMER

Basic concepts – Monomers – Functionality. Classification of polymers and characteristic features of each Natural and Synthetic polymers – Thermoplastic and Thermo-setting Plastic, Elastomers, Fibers and Liquid Resins – Addition and Condensation polymers – Linear, Branched and Cross – linked polymers – Homopolymers and Copolymers – Types of copolymers – Alternate, Graft, Block and Random copolymers. Tacticity in polymers – Isotactic, Syndiotactic and atactic polymers.

Importance of Molecular Weight: Degree of polymerization and molecular weight – Number average, Weight average and Viscosity average molecular weights .Glass transition temperature (T_g) – Definition – Factors affecting T_g – relationship between T_g and molecular weight and melting point. Important of T_g .

UNIT II CHEMISTRY OF POLYMERISATION AND POLYMERISATION TECHNIQUES

Chemistry of Polymerisation: Addition and Condensation polymerisation -Mechanism of polymerization – Free radical and ionic (anionic and cationic) polymerisation- Ring opening polymerization, Coordination polymerization – Zeigler Natta catalysts.

Bulk, solution, suspension, emulsion, melt condensation and interfacial poly-condensation polymerization.

UNIT III ORGANIC AND INORGANIC POLYMERS

Preparation and Applications

Organic Polymers

Plastics :Polyethylene, Polyvinyl chloride, Polymethyl methacrylate, Polyethylene terphthalate, Teflon, Bakelite

Rubbers :Natural and synthetic rubbers – Polybutadiene, Polyisobutylene, Butyl rubber, Nitrile rubber, Buna – S, Buna-N, Neoprene rubber.

Synthetic fibers : Nylon 6,6, Nylon 6, Rayon.

Inorganic Polymers :Poly(sulphur nitride) (SN)_x, Borazine, Poly(boron nitride), Polyphosphazenes, Silicones.

UNIT IV POLYMER PROCESSING AND POLYMER DEGRADATION

Polymer Processing: Basic principles of processing – Shape and Size – Processing parameters – Polymer compounding – Additives – Fillers – Plasticizers –Antioxidants - Flame retardants – Stabilizers – Colourants .

Processing techniques :Injection moulding – Compression moulding-Blow moulding – Extrusion moulding – Calendaring – Casting – Roaming- Laminating – Coating.

Polymer Degradation – Types of degradation – Thermal degradation – Mechanical degradation. Ultrasonic degradation. Photo degradation – Oxidation degradation – Hydrolytic degradation.

UNIT V SPECIAL TOPICS IN POLYMER SCIENCE

Conducting Polymers: Definition, Types of conducting polymer- Mechanism of electrical conduction – Soliton- Polaron and Bipolaron- Polyacetylene – Polyaniline-Polyaniline nanowire.

Biopolymers: Biomedical polymers – Contact lens – Dental polymers – Polymers used in Artificial Heart, Kidney, Skin, and Blood cells.

Plastic Waste Management – Chemical recycling – Incineration – Pyrolysis – Mixed waste recycling – Types of recycling (1⁰, 2⁰, 3⁰ and quaternary) development for recycled material

Text books

1. V.R. Gowarikar, N.V.Viswanathan and J.Sreedhar. Polymer science, wiley Eastern, 1995.
2. F.N. Billmeyer, Text book of polymer science, Wiley Interscience, 1971.
3. Mcurie Morten, Rubber technology, Van Nostrand, Reinold, Newyork
4. B.K. Sharma, Polymer Chemistry, Goel Publishing Home, Meerut, 2011.
5. Nabil Mustafa – “Plastic waste management” Marcel Dekker Inc – 1993.
6. Material Science 2ndedition , P.K.Palanisamy SCITECH Publications India Pvt.Limited Chennai 1st reprint ,March 2005

Reference Books

1. M. Jenkins, Biomedical polymers, University Birmingham, U.K, Woodhead Publishing 2007
2. M.G. Arora, M.Singh and M.S Yadew, Polymer chemistry, 2nd Revised edition, Anmol Publications Ltd 2003.
3. Principles of Polymer Science, P.Bahadur, N.V.Sastry, Narosa Publications 2002.
4. Physical chemistry polymers – A. Tager, Miv Publishers 1972.
5. Polymer chemistry – Properties and applications, Andrew Peacock, Allidon Calhoun, Hanser Publishers, Munich 2006
6. Modern Chemistry , David,W.Oxtoy, H.P.Gills,Allan Campion Brooks Cenage .Learning India Private Limited, 1st reprint ,March 2008

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Classify the polymers based on their characters and structures.	K1
CO2	Explain the mechanisms and techniques of polymerization.	K5
CO3	Discuss the applications of various organic and inorganic polymers.	K6
CO4	Summarize the advantages and disadvantages of polymer processing and degradation techniques.	K2
CO5	List out the important applications of conducting polymers , biopolymers and explain the plastic waste management.	K1 K5

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs & PSOs:

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	S	S	M	S	L	S	M	L	S	L	M
CO2	S	S	S	M	S	S	M	S	S	M	S	M	S
CO3	S	M	L	M	L	M	L	S	M	M	L	S	S
CO4	S	L	S	S	M	S	M	M	L	S	S	M	S
CO5	S	M	S	L	M	S	L	S	M	L	S	M	S

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated

SEMESTER V
MAJOR ELECTIVE I
BIO CHEMISTRY

L	T	P	C
4	0	0	4

Course Objectives

The primary objectives of this course are to

1. Get knowledge about amino acids and protein
2. Study about carbohydrates
3. Know the lipids and its significance
4. Understand basics of enzymes and its catalytic activity
5. Acquire knowledge on nucleic acids and significance of blood.

UNIT I AMINO ACIDS AND PROTEINS

Living Cell: Plant and Animal Cells :Cell Membrane- Organells- Functions of major Cellular components- Anabolism and Catabolism and their relation to Metabolism

Amino acids :Classification- Abbreviated names (one letter- three letter)- Physical properties- Optical properties- Chemical Properties.

Peptides: Nomenclature- Properties of Peptide bond - Solid phase peptide Synthesis.

Proteins: Synthesis – Classification – properties - Structure of protein - Primary, Secondary, Tertiary and Quarternary structure- N-terminal and C-terminal aminoacid Structure analysis . Sequencing techniques- Edman degradation.

Catabolism of aminoacids: Transamination- Oxidative deamination- Urea cycle .

UNIT II CARBOHYDRATES AND METABOLISM

Monosacharides - Structure of aldoses and ketoses: Ring structure of sugars - Conformation of sugars- Mutarotation- Anomers- Epimers and Enantiomers; Structure of biologically important sugar derivatives - Oxidation and Reduction of sugars;

Disacharides and Polysaccharides: Formation of disaccharides- Reducing and Non-reducing

disaccharides-Polysaccharides: Homo polysaccharides (Starch- Cellulose- Glycogen)- Hetero polysaccharides (Mucopolysaccharides- Hyalunonic acid- chondroitin sulphate- Heparin)

Carbohydrate metabolism: Embden Meyerhof pathway- Citric acid cycle.

UNIT III LIPIDS

Definition and classification of lipids- Classification of Fatty acids – Glycerids - Physical and Chemical properties - Analysis of Oils and Fats (Saponification number, Iodine number, Polenske number, Richert –Meissel number, Acetyl value).

Phospholipids- Glycerophospholipids: Lecithin- Cephalin- Phosphatidylserine- Phosphatidylinositol- Plasmalogens.

Sphingophospholipid: Sphingomyelin- Glycolipid-Cholesterol and Bile acids (structural elucidation not required).

UNIT IV ENZYMES

Classification and Nomenclature of enzymes - General Characteristics of enzymes - Nature of enzymes – Protein and Non-protein- Cofactor and Prosthetic group, Apoenzyme, Holoenzyme - TPP, NAD, NADP,FAD, FADH₂,ATP and their importance in enzyme actions.

Enzyme activity and specific activity- Features of enzyme catalysis, Factors affecting the rate of chemical reaction- Catalytic power and specificity of enzymes (concept of active sites) , Fischer lock and key model , Koshland's induced fit model.

UNIT V NUCLEIC ACIDS AND CLINICAL CHEMISTRY

Nucleic Acid: RNA-DNA- Nucleosides& Nucleotides – Structure of DNA and RNA – Ribosomal RNA (r-RNA) - Transfer RNA (t-RNA) – Messenger RNA (m-RNA)

Blood & Analysis of Blood :Components of blood and their functions- Difference between plasma and serum- **Blood groups :** Rh factors – Blood analysis: Fasting blood sugar, Random blood sugar, Post prandial blood sugar – Hb1AC – Albumin – Urea - **Cholesterol:** HDL &LDL.

Text Books

- 1.Fundamentals of Biochemistry by J.L.Jain, Sanju Jain& Nitin Jain Publishers Chand and Co Ltd, ISBN81-219-2453-7, 2008
2. Lehninger: Principles of Biochemistry 6th ed., Nelson,D.L. and Cox, M.M., W.H. Freeman and company (Newyork), ISBN: 13j 978-1-4641-09621-1, ISBN : 10: 1-4292-3414-8., 2013.
3. Textbook of Biochemistry with clinical correlations ,7th ed., T.M Delvin,, John Wiley & Sons , Inc (Newyork), ISBN: 978-0-470-28173-4, 2011.

4. Robert L.Caret, Katherine J.Dennistom Joseph J. Topping, Principles and application of organic and biological chemistry,WBB Publishers, USA, 1993.

Reference Books

1. Principles of protein structure, G.E. Schulz, and R.H. Schirmer. Springer, 1st edition 1996.
2. Medical Laboratory Technology, Volume I, Kanai, L. Mukorjee, CBS Publishers,2002.
3. Medical Laboratory Technology- Ramnik sood, , JPB Publishers,2009
4. J.L.Jain, Biochemistry, Sultan Chand and Co. 1999
5. A.Mazur amd B. Harrow, Textbook of biochemistry, 10th edition W.B. Saunders Co., Philadepia, 1971.
6. Paula Yurkanis Bruice, Organic Chemistry, 3rd edition, Pearson education, Inc.(Singapore), NewDelhi, reprint, 2002.
7. P.W. Kuchel and G.B. Ralston, Shaum series. Theory and Problems of Biochemistry , Mc Graw- hill Nool company, Newyork 1988.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Compare the characters of amino acids and proteins.	K2
CO2	Explain the important properties and functions of carbohydrates.	K2
CO3	Classify the lipids and analyse its specific functions.	K2K4
CO4	List out the various enzymes involved in biochemical reactions and specify its catalytic activities.	K1
CO5	Distinguish DNA & RNA and find the functions of components in blood.	K4K1

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs &PSOs :

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	S	S	L	M	L	S	M	M	L	S	M
CO2	M	S	S	L	S	S	M	S	S	S	M	L	S
CO3	S	S	M	S	M	L	L	M	M	S	M	L	M
CO4	M	L	S	M	S	S	M	S	S	S	M	M	L
CO5	S	S	S	S	M	L	L	S	L	M	S	L	M

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated

SEMESTER V
MAJOR ELECTIVE II
MORDERN INSTRUMENTAL ANALYTICAL TECHNIQUES

L	T	P	C
4	0	0	4

Course Objectives

The main objectives of this course are

1. Understand the Principles of chromatography and its practical applications.
2. Study various thermo analytical techniques.
3. Acquire knowledge in electro analytical techniques.
4. Gain the knowledge on the basis of spectrophometry and analytical applications.
5. Study on radio analytical techniques.

UNIT I CHROMATOGRAPHY

Chromatography- Classification-Principles of adsorption- adsorbents.

Thinlayer Chromatography-Choice of adsorbents and solvents- Preparation- R_f values

Paper Chromatography- Principle-Solvent used –Factors affecting R_f values

Applications of Thinlayer and Paper Chromatography.

Ion-Exchange Chromatography-Principle –Type of resins- Requirements of good resin-Action of resins-Experimental techniques and applications.

Gas Chromatography : Principle –Experimental techniques and applications

High Performance Liquid Chromatography: Principle - Instrumentation-Applications.

UNIT II THERMOANALYTICAL METHODS

Thermogravimetric Analysis(TGA): Principle, Instrumentation-Working-Function of each component, Applications of TGA, Study of Oxalates, Sulphates and Nitrates by TGA .

Differential Thermal Analysis(DTA): Principle- Instrumentation- Methodology-Applications, DTA of Calcium Oxalate Monohydrate and Manganese Phosphine Monohydrates.

Differential Scanning Calorimetry (DSC): Principle –Instrumentation - Methodology-Applications- Determination of glass transition temperature(T_g).

Thermometric Titrations: Principle-Experimental Techniques- Types of Thermometric reaction and Applications.

UNIT III ELECTRO ANALYTICAL TECHNIQUES

Introduction to electroanalytical techniques – types of electroanalytical techniques.

Electrogravimetry – Principle of electrogravimetric analysis –Determination of copper – Electrolytic separation of copper and nickel.

Coulometry Analysis : Principle of coulometric analysis-Coulometric Titrations-Applications

Voltametry : Polarography-Principle-Experimental assembly-Importance of polarographic curves-Applications to qualitative and quantitative analysis.

Amperometric titrations: Principles and applications

Cyclic Voltametry : Principles and applications.

UNIT IV SPECTROPHOTOMETRY

UV-Visible spectrophotometry: Beer-Lamberts law, Instrumentation-Applications.

Fluorometry: Principles – Instrumentation –Applications.

Flame Photometry: Theory- Instrumentation and Applications.

Atomic Absorption Spectrometry: Theory – Instrumentation and Applications.

Turbidimetry and Nephelometry: Principle- Instrumentation and Applications.

UNIT V RADIOANALYTICAL METHODS

Radio active nuclides, Instrumentation, measurement of α , β & γ radiations.

Radio tracers and Tracer techniques-Application of tracer techniques

Neutron activation analysis: Neutron sources, Interaction of neutrons with matter. Theory of activation methods, Experimental considerations, Non-destructive and destructive methods, Applications.

Isotopic dilution Analysis-Principle –Theory and Applications

Radiometric Titrations: Principle- Procedure, Advantages and Disadvantages, Applications to various types of titrations. Application of radiochemical methods in Biology, Agriculture and Environment.

Text Books

1. Fundamentals of Analytical Chemistry, Skooge, West and Hollers, Saunders college, publishing, edition, 6th 1991, VII edition, 1996.
2. Vogel's, Text book of Quantitative Chemical Analysis – A.I. Vogel, Pearson Education Ltd, 6th edition, 2001.
3. Hand book of Instrumental Techniques for Analytical Chemistry – F. Settle, Printice Hall Inc., 1997.
4. Radioanalytical Chemistry 2007, B. Khan, Springer, 220-231, New York, 2007

Reference Books

1. Analytical Methods, R. Gopalan and K.S. Visvanathan, University Press, I edition, 2018.
2. Quantitative Chemical Analysis, DC. Harris, W.H. Freeman Publication, IV edition, 1995.
3. W. D. Ehmann, D. E. Vance, D. Radio Chemistry and Nuclear Methods of Analysis 1st edition, Wiley-Inter Science, US 1991
4. Analytical Chemistry – Gray D. Christian, John Wiley & Sons, INC, 5th edition, 2001.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Discuss the application of various chromatographic techniques	K6
CO2	Explain the principles and analytical applications of Thermoanalytical techniques.	K2, K3
CO3	Determine the concentration of metal ions using suitable electro analytical techniques.	K5
CO4	Outline the principle and applications of various spectroanalytical methods	K1, K3
CO5	Analyze the basic concepts of radioanalytical methods and analytical application	K3

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs &PSOs :

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	S	S	S	S	S	L	M	S	M	M	L	S
CO2	S	S	S	S	M	S	M	S	S	M	S	L	M
CO3	S	S	S	M	S	M	L	M	S	S	L	M	S
CO4	S	S	S	S	L	M	L	S	S	S	M	L	M
CO5	S	M	S	L	M	S	M	S	M	L	M	S	S

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SEMESTER V
MAJOR ELECTIVE II
APPLIED CHEMISTRY

L	T	P	C
4	0	0	4

Course Objectives

The Primary objectives of this course are to

1. Gain knowledge on fuels.
2. Study about industrially important compounds.
3. Acquire knowledge about basic needs of Agriculture developments.
4. Learn the substances useful for human life.
5. Study on Match and Silicate Industries.

UNIT I FUEL CHEMISTRY

Fuels- Definition-Classification – Combustion and Chemical Principles - Calorific value- Characteristics of a good fuel.

Solid fuel: Coal – Types – Gross and Net calorific values- Proximate and Ultimate analysis of coal – High and low temperature of carbonization – Uses.

Liquid fuels : Petroleum and its Chemical Composition- Cracking of heavy oil residues- Thermal and catalytic cracking, Knocking, Anti-knocking and Chemical structure, Octane and Cetane numbers – Significance - Petroleum products and their applications.

Gaseous fuels: Preparation and Specific uses of Producer gas, Water gas. LPG and Gobar gas. Advantages and Disadvantages of Solid, Liquid and Gaseous fuels.

Rocket fuels- Classification of Solid Propellants, Liquid Propellants- Combustion -Spontaneous ignition temperature(SIT) - Combustion calculation.

UNIT II : PAINTS, LUBRICANTS, ADHESIVES AND PIGMENTS

Paints :Classification- Primary constituents, Manufacturing of paints, Emulsion paint- Constituent and advantages-Latex paints and Fire retardant paints, Solvents and Thinners.

Lubricants: Functions of lubricants-Properties and Classifications -Additives for lubricating oil, Lubricants of mineral origin. Lubricating grease and Solid lubricants.

Adhesives: Classification and preparation of adhesives. Synthetic resin adhesives and Rubber based adhesives –Uses of adhesives.

Pigments: Characteristics and uses of TiO_2 , Ultramarine Blue and Red lead.

UNIT III AGRICULTURAL CHEMISTRY

Fertilizers: Raw material, manufacture (flow chart)- Chemical process (with equation) of ammonium nitrate, ammonium sulphate, urea, ammonium phosphate, super phosphate, triple super phosphate, NPK fertilizers.

Pesticides: Classification of pesticides, examples.

Insecticides: Stomach poisons, Contact insecticides, Fumigants, Manufacture and uses of Insecticides: DDT, BHC, Pyrethrin, Aldrin and Pentachlorophenol.

Fungicides: Bordeaux mixture, Lime sulphur, Creosote oil.

UNIT IV OILS, SOAPS AND DETERGENTS

Oils: Definition : Fats and Oils- Constituents- Sources-Difference between oils and fats, Manufacture of Cotton seed oil, Sunflower oil and Soyabean oil.

Soaps : Definition, Manufacture of soaps- Types of soaps -Specific uses.

Detergents: Difference between soaps detergents, Synthetic detergents- Surface active agents and their classification- Anionic, Cationic and Non –ionic detergents – Applications including cleaning action.

UNIT V MATCH AND SILICATE INDUSTRIES

Match Industry

Types of Matches- Composition of match head and strikening surface- Manufacture of safety matches- Coloured matches- Pyrotechniques and explosives, Classification of good explosives TNT, RDX ,Gun powder, Ammonium nitrate.

Silicate industry

Cement :Types of cements, composition , manufacture of Portland cement and Setting of cement.

Ceramics: Introduction, Types, Manufacture, and Applications, Refractory materials.

Glass :Definition, Composition, Types, Manufacturing of glass products, Physical and Chemical properties, Applications.

T

ext Books

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2003.
2. James A. Kent, Riegel's Hand book of Industrial Chemistry, Springer Science, 2013.

Reference Books

1. C.E. Dryden, Outlines Chemical Technology, Gopala Rao, East west Press, New Delhi
2. S . Johnson, N .Saikia, Fatty acids Profile of edible oils and fats in India, Centre for Science and Environment, New Delhi, India.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Define fuels and Explain various types of fuels	K1 , K5
CO2	Choose the suitable paints, pigments, lubricants and adhesives for day to day life activities.	K3
CO3	Analyze the highly useful fertilizers, pesticides, insecticides and fungicides to improve crop yield.	K4
CO4	Discuss the oils, soaps and detergents which are necessary for human health and other activities	K6, K1
CO5	Outline the industrially important compounds for the human development activities.	K2

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs &PSOs :

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	S	M	S	L	L	M	M	L	S	M	S
CO2	S	S	S	S	M	S	L	S	M	L	M	M	S
CO3	S	M	S	S	L	M	M	M	M	S	S	L	S
CO4	S	S	M	L	S	S	L	L	M	S	S	L	M
CO5	S	L	S	S	M	S	M	M	S	M	L	S	S

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SEMESTER VI
MAJOR ELECTIVE III
TEXTILE CHEMISTRY

L	T	P	C
4	0	0	4

Course Objectives:

The primary objective of the courses are to

1. Learn types of fibres and removal of impurities in fibres
2. Know briefly about natural and manmade fibres
3. Study on Dyeing and printing fibres

UNIT I TEXTILE FIBERS

Introduction to textiles and essential requirements of textile fibres – Classification of textile fibres – Natural and Man-made fibres – Characteristics of textile fibres. Advantages and Disadvantages of natural and man-made fibres.

Impurities in fibres – General principle of removal of impurities in fibres – singeing – Scouring – Bleaching – Desizing – Kierboiling – Chemicking – Degumming.

Flow charts showing the process involved in textile industry.

UNIT II NATURAL FIBRES

Natural fibres – Types of natural fibres – Natural Cellulosic fibres : Cotton and Jute – Natural protein fibres : Wool and Silk.

Cellulosic fibres : Cotton fibres – Geographical distribution, Structure, Physical and Chemical properties, Grading of cotton fibres -Uses of cotton.

Protein fibres: Silk fibre –Study of life cycle of silkworm – Extraction of silk fibre – Properties of silk fibre – Special features of silk fibre - Uses of silk– Wool- origin , different types of wool properties wool – Process involved in the removal of impurities from raw wool- Uses of wool.

Bast and leaf fibres – Types of bast fibres : Sisal and Ramie – Geographical distribution – Extraction – Properties of major bast fibres – Uses- Introduction to Coir , Hemp and Banana fibres.

UNIT III MAN-MADE FIBRES

Man-made fibres : General principle of manufacturing of Man-made fibres – Types of Man-made fibres –

comparison of Man-made fibres with natural fibres.

Regenerated fibres – Cellulosic fibres (Rayon and Acetate fibres) – Protein fibres (Azlons) – Production – Properties and Uses

Synthetic fibres – Poly amide fibres (nylons) – Polyester fibres –Polynosic fibres, Polyacrylic fibres – PolyUrethane – Polypropylene- polyolefins -Important Physical and Chemical properties and applications.

UNIT IV DYES AND DYEING OF FIBRES

Introduction of dyes – Classification, Properties and Uses of dyes – Dyeing of textile materials (Cotton, Wool and Silk) by direct, acid, basic, vat, disperse and reactive dyes – Fastness of properties of Dyed materials.

Finishes given to fabrics – Methods used to process of mercerizing antcrease and Anti shrink finishes water proofing.

UNIT V TEXTILE PRINTING

Textile printing – Difference between dyeing and printing – Different steps involved in printing : Preparation of materials , Preparation of printing paste, Different thickeners, Drying of printing – Washing and drying of printed material – Printing procedure of fibres

Printing with direct and azoic colours.

Text Books

1. Chemical Technology of Fibrous Materials, F.Sadov, M.Kovchagin and A. Mateshy Mir Publishers,Moscow,1978.
2. Dyeing and Chemical technology of textile fibres – 5th edition, E.R.Trotman Charless – Griffin and Co Ltd,1975
3. A Textbook of Fibre and Science and Technology, S.P.Mishra, New Age International (P) Ltd-2000.
4. James Ronald, Printing and Dying of Fabrics and Plastics, Maharajan Book Distributors, 1996.

Reference Books

- 1.. Chemistry of Dyes and Principles of Dyeing, 2nd Edition V.A.Shenai, Sevak Publications, Mumbai,1983.
2. Berns, R.Bill Meyer and Saltzmans, Principles of Colour Technology, 3rd edition, New York, NY; JohnWiley and Sons, Inc;2000.
3. V.A. Shenai, Introduction to the Chemistry of Dye Stuffs, Sevak, Mumbai 1991.
4. Textile Chemistry – Vol I and II, R.H. Peters Elsevier, Amsterdam, London,1963.
5. Introductory to Textile Science – 3rd edition, Maryory L.Joshep,3rd Edition, Holt, Rinehart and Winson,3 Publishers, 1977.

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Identify the natural and man made fibres and Analyse its characters.	K3, K4
CO2	Explain the characteristics of different natural fibres	K5
CO3	Illustrate the properties and uses of manmade fibres.	K3
CO4	Elaborate the dyeing process of fibres.	K6
CO5	Define Printing of fibres and Distinguish between dyeing and printing processes of fibres.	K1, K4

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs& PSOs :

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	S	M	L	S	L	S	L	L	S	L	S
CO2	M	S	M	S	M	L	M	S	S	M	M	S	M
CO3	S	S	L	S	S	S	L	S	M	S	S	L	S
CO4	S	S	S	S	M	S	L	S	S	S	L	M	S
CO5	M	S	M	S	L	M	M	S	M	L	S	M	M

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated

SEMESTER VI
MAJOR ELECTIVE III
NANOCHEMISTRY

L	T	P	C
4	0	0	4

Course Objectives

The primary objectives of this course are to

1. Know the fundamentals of nano chemistry.
2. Study the methods of preparation of nanomaterial.
3. Acquire the knowledge on characterization of nanoparticles.
4. Know the important applications of nanomaterials in various fields.
5. Gain the Knowledge on the nano materials and its uses.

UNIT I FUNDAMENTALS OF NANOCHEMISTRY

Introduction: Background to Nanoscience – Scientific Revolution – Feynman’s Vision.

Definition : Nanochemistry, Nanosized effects, Quantum effects – Surface to Volume ratio - Size dependence properties of Nanoparticles- Optical, Electrical, Magnetic and Chemical properties.

Nanomaterials : Definition and Classification of Nanomaterials -1D Nanomaterials : Quantum well -2D Nanomaterials : Nanowires, Nanotubes, Thinflim -3D Nanomaterials : Nanopaprticles, Quantum dots, Nanoclusters, Nanocrystals.

Nanocomposites: Definition and classification of Nanocomposites – Structure and specific properties of Nanocomposites.

UNIT IISYNTHESIS OF NANOMATERIALS AND NANOCOMPOSITES

Types of approaches : Topdown (physical) approach and Bottom-up (chemical) approach.

Physical methods: Laser ablation, Arc discharge and Sputtering methods.

Chemical methods: Chemical reduction, Colloidal and Chemical precipitation methods, Solgel, Sonochemical and Chemical vapour deposition methods

Biosynthesis :Synthesis of Nanoparticles by bacteria and fungi.

Greensynthesis : Synthesis of Nanoparticles using plant extracts.

UNIT III CRYSTALLINITY, SURFACE AND OPTICAL CHARACTERIZATION TECHNIQUES

Determination of Particle size, Crystallinity and Surface area: Electron Microscope, Dynamic Light Scattering (DLS), X-ray Diffraction techniques

Morphology:

Surface Topography : Scanning Electron Microscope (SEM) Transmission Electron Microscope (TEM)

Surface compositions: Atomic Force Microscope (AFM), X-ray Photoelectron spectroscopy (XPES).

Elemental Analysis : Energy dispersive X-ray spectra (EDXS)

Band gap Analysis : UV- visible spectroscopy

Unit IV APPLICATIONS OF NANOMATERIALS AND NANOCOMPOSITES

Nanomaterials: Energy Resources : Batteries, Fuel cells, Solar cells.

Medicinal uses : Nanomedicine, Drug delivery, Cancer drugs.

Catalytic uses: Water purification, Energy storage, Biodiesel production, Automobile industries.

Sensor Applications: Environmental (toxic gases, toxic metal ions).

Nanocomposites: Lubricants, Anti-corrosion barrier, Coatings, Aerospace, Food package, Gas barrier, Chemical resistant.

UNIT V PREPARATIONS, PROPERTIES, AND APPLICATIONS OF SPECIAL NANOSCALE MATERIALS

Nanoforms of carbon : Buckminsterfullerene – Graphene – Carbon nanotubes : Single wall carbon nanotube (SWNT) , Multiwall carbon nanotubes (MWNT), Carbon nanofibers.

Nanometal oxides & Chalcogenides : ZnO , TiO₂ , ZrO₂ (Semiconductor oxides) ZnS, CdSe.

Nanocomposites: Clay nanocomposites - Polymer clay nanocomposites, Kaolins clay nanocomposite, Montmorillonite clay nanocomposite.

Text Books

1. Geoffy A. Ozin and Andre C. Arsenault “ Nanochemistry : A Chemical approach to nano materials “, RSC Publishing U.K 2005.
2. Hari Singh Nalwa, “ Nano Materials and Nanotechnology” Academic press, New York ,2002.

3. C.N.R. Rao, A. Muller and A.K .Cheetham, “ The Chemistry of Nanomaterials, Volume I and II”, Wiley- VCH Verlag GmbH & Co, KGaA, Weinheim ,2004.
4. Catalysis : Principles and Applications, Edited by B. Visvanathan, S.Sivasankar, A.V. Ramaswamy, Narosa publishing House, 2011.

Reference Books

1. Carbon nanotubes and Nanostructures techniques and applications, James E. Morris, Krzyshof, Iniewski, CRC Press, 2013.
2. Nanocomposite : Science and Technology P.M. Ajayan, L.S.Schadler,P.V Braun , Wiley – VCH Verlag 2003.
3. Fundamentals of Nanotechnology, Hornyak G,, Louis Tibbals, H-F. Dutta,Toy deep, Press, 2000

COURSE OUTCOMES

COURSE OUTCOMES		COGNITIVE LEVEL
CO1	Define the different nanosized materials and analyze their peculiar properties.	K1, K4
CO2	List out the various physical, chemical and biological methods of synthesis of nanomaterials	K1, K2
CO3	Choose the suitable analytical techniques to characterize nanoparticles.	K3
CO4	Elaborate the various applications of nanomaterials and nanocomposites.	K6
CO5	Summarize the important nanocompounds and Explain their specific uses.	K2, K5

K 1 –Remember K 2 – Understand K 3 - Apply K 4 – Analyze K 5 –Evaluate K 6 - Create

Mapping of COs with POs & PSOs:

CO/PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	S	M	S	L	M	M	L	S	M	M	S	L	M
CO2	S	S	S	S	M	S	M	S	S	S	M	S	M
CO3	S	S	S	S	S	M	L	S	M	L	S	S	S
CO4	S	M	M	M	S	S	L	S	M	M	L	M	S
CO5	S	M	L	M	L	M	M	S	S	S	M	L	M

S – Strongly Correlated ; M – Medium Correlated ; L – Low Correlated



MANONMANIAM SUNDARANAR UNIVERSITY TIRUNELVELI – 12

**MODIFIED AND CORRECTED SYLLABUS
(RECEIVED FROM CHAIRPERSON ON 13.10.2023.)**

M.Sc CHEMISTRY (Choice Based Credit System)

**TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI – 600 005**

FROM THE ACADEMIC YEAR 2023 – 2024

**M.Sc. CHEMISTRY
(Choice Based Credit System)
PG - COURSES – AFFILIATED COLLEGES**

(For those who joined from 2023- 2024 onwards)

1. PREAMBLE

Taxonomy forms three learning domains: Cognitive (knowledge), affective (attitude) and psychomotor (skill). This classification enables to estimate the learning capabilities of students. Briefly, it is aimed to restructure the curriculum as student-oriented, skill-based, and institution- industry interaction curriculum with the various courses under "Outcome Based Education with Problem Based Courses, Project Based Courses, and Industry Aligned Programmes" having revised Bloom's Taxonomy for evaluating students' skills.

Cognitive Domain

(Lower levels: K1: Remembering; K2: Understanding; K3: Applying; Higher levels: K4: Analyzing; K5: Evaluating; K6: Creating)

Affective Domain

Psychomotor Domain.

All the changes in life in one-way or other involve chemistry. Chemistry is central to the current revolutions in science. No educated person today can understand the modern world without a basic knowledge of chemistry. The existence of a large number of chemical factories, mines and related industries necessitates chemistry education. An advanced course in chemistry will be a fascinating experience because it helps us understanding our surroundings. Hence, the Programme M.Sc. (Chemistry) is offered to meet current needs of aspiring youths and also create awareness about the in-depth scientific aspects to the society.

2. FRAMEWORK FOR POSTGRADUATE EDUCATION

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI - 12 PG - COURSES – AFFILIATED COLLEGES FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	M. Sc Chemistry
Programme Code	
Duration	PG – 2 YEARS
Programme Outcomes (POs)	<p>PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p>PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.</p> <p>PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p>PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.</p> <p>PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.</p>

	<p>PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p>PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.</p> <p>PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.</p> <p>PO9: Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p>PO10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life.</p>
<p>Programme Specific Outcomes (PSOs)</p>	<p>PSO1 – Placement Prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO2 – Entrepreneur Create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World Produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO5 – Contribution to the Society Contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>

**3. Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF)
Guideline Based Credits and Hours Distribution System
First Year – Semester – I**

Part	List of Courses	Credits	No. of Hours
	Core – I	4	5 (4L + 1T)
	Core – II	4	5 (4L + 1T)
	Core – III - Practical	3	5 (4P + 1T)
	Core – IV - Practical	3	5 (4P + 1T)
	Elective - I	3	5 (4L + 1T)
	Elective – II	3	5 (4L + 1T)
		20	30

Semester – II

Part	List of Courses	Credits	No. of Hours
	Core – V	4	5(4L + 1T)
	Core – VI	4	5(4L + 1T)
	Core – VII - Practical	3	4(3P + 1T)
	Core – VIII - Practical	3	4(3P + 1T)
	Elective - III	3	4(3L + 1T)
	Elective – IV	3	4(3L + 1T)
	Skill Enhancement Course - I	2	4
		22	30

Second Year – Semester – III

Part	List of Courses	Credits	No. of Hours
	Core – IX	5	6(5L + 1T)
	Core – X	5	6(5L + 1T)
	Core – XI - Practical	4	5(4P + 1T)
	Core (Industry Module) – XII - Practical	5	5(4P + 1T)
	Elective – V	3	4(3L + 1T)
	Skill Enhancement Course - II	2	4
	Internship / Industrial Activity (Carried out in Summer Vacation at the end of I year – 30 hours)	2	-
		26	30

Semester-IV

Part	List of Courses	Credits	No. of Hours
	Core – XIII	5	6(5L + 1T)
	Core – XIV	5	6(5L + 1T)
	Project with VIVA VOCE	7	10
	Elective – VI (Industry Entrepreneurship)	3	4
	Skill Enhancement Course – III / Professional Competency Skill	2	4
	Extension Activity (Can be carried out from Sem II to Sem IV)	1	-
		23	30

Total 91 Credits for PG Courses

4. COMPONENT WISE CREDIT DISTRIBUTION

Credits		Sem I	Sem II	Sem III	Sem IV	Total
Part A		20	20	22	20	82
Part B	(i) Discipline – Centric / Generic Skill		2	2	2	6
	(ii) Summer Internship / Industrial Training			2		2
Part C					1	1
Total		20	22	26	23	91

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components Part B and Part C have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree.

5. LEARNING AND TEACHING ACTIVITIES

5.1 Topic wise Delivery method

Hour Count	Topic	Unit	Mode of Delivery

5.2. Work Load

The information below is provided as a guide to assist students in engaging appropriately with the course requirements.

Activity	Quantity	Workload periods
Lectures	60	60
Tutorials	15	15
Assignments	5	5
Cycle Test or similar	2	4
Model Test or similar	1	3
University Exam	1	3
Total		90 periods

6. TUTORIAL ACTIVITIES

Tutorial Count	Topic

7. LABORATORY ACTIVITIES

8. FIELD STUDY ACTIVITIES

9. ASSESSMENT ACTIVITIES

9.1. Assessment Principles

Assessment for this course is based on the following principles

1. Assessment must encourage and reinforce learning.
2. Assessment must measure achievement of the stated learning objectives.
3. Assessment must enable robust and fair judgments about student performance.
4. Assessment practice must be fair and equitable to students and give them the opportunity to demonstrate what they learned.
5. Assessment must maintain academic standards.

9.2. Assessment Details

Assessment Item	Distributed Due Date	Weightage	Cumulative Weightage
Assignment 1	3 rd week	2%	2%
Assignment 2	6 th Week	2%	4%
Cycle Test – I	7 th Week	6%	10%
Assignment 3	8 th Week	2%	12%
Assignment 4	11 th Week	2%	14%
Cycle Test – II	12 th Week	6%	20%
Assignment 5	14 th Week	2%	22%
Model Exam	15 th Week	13%	35%
Attendance	All weeks as per the Academic Calendar	5%	40%
University Exam	17 th Week	60%	100%

10. TEACHING METHODOLOGIES

1. Traditional Teaching methods like Chalk and Board, Virtual Class room, LCD projector, Smart Class, Video Conference, Guest Lectures.
2. Asking students to formulate a problem from a topic covered in a week's time Assignment, Class Test, Slip test.
3. Asking students to use state-of-the-art technologies/software to solve problems. Applications: Use of chemdraw, chempaint software
4. Introducing students to applications before teaching the theory.
5. Training students to engage in self-study without relying on faculty (for example – library and internet search, manual and handbook usage, etc.)
 - 5.1 Library, Net Surfing, Manuals, NPTEL Course Materials published in the website
 - 5.2 Other university websites.

11. FACULTY COURSE FILE STRUCTURE

CONTENTS

- a) Academic Schedule
- b) Students Name List
- c) Time Table
- d) Syllabus
- e) Lesson Plan
- f) Staff Workload
- g) Course Design (content, Course Outcomes (COs), Delivery method, mapping of COs with Programme Outcomes (POs), Assessment Pattern in terms of Revised Bloom's Taxonomy)
- h) Sample CO Assessment Tools
- i) Faculty Course Assessment Report (FCAR)
- j) Course Evaluation Sheet
- k) Teaching Materials (PPT, OHP etc.)
- l) Lecture Notes
- m) Home Assignment Questions
- n) Tutorial Sheets
- o) Remedial Class Record, if any
- p) Projects related to the Course

- q) Laboratory Experiments related to the Courses
- r) Internal Question Paper
- s) External Question Paper
- t) Sample Home Assignment Answer Sheets
- u) Three best, three middle level and three average Answersheets
- v) Result Analysis (CO wise and whole class)
- w) Question Bank for Higher studies Preparation (GATE/Placement)
- x) List of mentees and their academic achievements

12. COURSE STRUCTURE

M. Sc CHEMISTRY

Illustration - I

	First Year Semester-I	Credit	Hours per week	Marks (Max 100)		Duration for UE
				CIA	UE	
Part A	CC1 – Organic Reaction Mechanism-I	4	5	25	75	3 Hrs
	CC2 – Structure and Bonding in Inorganic Compounds	4	5	25	75	3 Hrs
	CC3 – Organic Chemistry Practical - I	3	5	50	50	6 Hrs
	CC4 – Physical Chemistry Practical	3	5	50	50	6 Hrs
	Elective I – EC1 (One from Group A) Pharmaceutical Chemistry/ Nanomaterials and Nanotechnology	3	5	25	75	3 Hrs
	Elective II – EC2 (One from Group B) Electrochemistry/Molecular Spectroscopy	3	5	25	75	3 Hrs
	Total	20	30			

	Semester-II	Credit	Hours per week	Marks (Max 100)		Duration for UE
				CIA	UE	
Part A	CC5 – Organic reaction mechanism-II	4	5	25	75	3 Hrs
	CC6– Physical Chemistry-I	4	5	25	75	3 Hrs
	CC7 – Organic Chemistry Practical - II	3	4	50	50	6 Hrs
	CC8 – Inorganic Chemistry Practical - I	3	4	50	50	6 Hrs
	Elective III–EC3 (One from Group C) Medicinal Chemistry/Green Chemistry	3	4	25	75	3 Hrs
	Elective-IV-EC4 (One from Group D) Bio Inorganic Chemistry/Material Science	3	4	25	75	3 Hrs
Part B	Skill Enhancement Course -SEC I (One from Group G) Industrial Chemistry	2	4	25	75	3 Hrs
	Total	22	30			

13. CONSOLIDATED TABLE FOR CREDITS DISTRIBUTION

	Category of Courses	Number of Courses	Number of Credits in each Category of Courses	Total Credits	Total Credits for the Programme
PART A	Core	14	57	82	88 (CGPA)
	Project with viva voce	1	7		
	Elective (Generic and Discipline Centric)	6	18		
PART B (i)	Skill Enhancement (Term paper and Seminar & Generic / Discipline - Centric Skill Courses) (Internal Assessment Only)	3	6	6	03 (Non CGPA)
PART B(ii)	Summer Internship	1	2	2	
PART C	Extension Activity	1	1	1	
					91

14. ELECTIVE COURSES

Courses are grouped (Group A to Group E) so as to include topics from Pure Chemistry (PC), Applied Chemistry (AC) and Industrial Components (IC) like Pharmaceutical Industries, Polymer labs courses for flexibility of choice by the stakeholders / institutions.

Semester I: Elective I and Elective II

Elective I to be chosen from **Group A** and **Elective II** to be chosen from **Group B**

Group A: (PC/AC/IC)

1. Pharmaceutical Chemistry
2. Nanomaterials and Nanotechnology

Group B (PC/AC/IC)

1. Electrochemistry
2. Molecular Spectroscopy

Semester II: Elective III & Elective IV

Elective III to be chosen from **Group C** and **Elective IV** to be chosen from **Group D**

Group C:(PC/AC/IC)

1. Medicinal Chemistry
2. Green Chemistry

Group D (PC/AC/IC)

1. Bioinorganic Chemistry
2. Material Science

Semester III: Elective V

Elective V to be chosen from **Group E**

Group E: (PC/AC/IC)

1. Pharmacognosy and Phytochemistry
2. Biomolecules and Heterocyclic compounds

15. SKILL ENHANCEMENT COURSES

Skill Enhancement Courses are chosen to keep in pace with the latest developments in the academic / industrial front and provides flexibility of choice by the stakeholders / institutions.

Group G (Skill Enhancement Courses) SEC: (Practical based paper)

- Computational Chemistry
- 3D printing in Chemistry
- Preparation of Consumer products

- Chemistry in everyday life
- Cosmetic Chemistry
- Origin lab
- Industrial Chemistry
- Research Tools and Techniques

16. TESTING PATTERN

16.1 Internal Assessment

THEORY: For theory courses, there shall be three tests conducted by the faculty concerned and the average of the best two can be taken as the Continuous Internal Assessment (CIA) for a maximum of 25 marks. The duration of each test shall be one / one and a half hour.

There is no minimum pass mark for internal. But, if it is less than 50%, it should be compensated in the external.

Components	Marks
The average of the best two tests from three compulsory tests	15
Assignment	05
Seminar	05
Total	25

Computer Laboratory Courses: For Computer Laboratory Oriented Courses, there shall be two tests in Theory part and two tests in Laboratory part. Choose one best from Theory part and other best from the two Laboratory part. The average of the best two can be treated as the CIA for a maximum of 25 marks. The duration of each test shall be one / one and a half hour. There is no improvement for CIA of both theory and laboratory, and, also for University End Semester Examination.

PRACTICAL

Maximum marks: 50

There is no minimum pass mark for internal. But, if it is less than 50%, it should be compensated in the external.

The break-up for the internal component will be as follows:

Components	Marks
Number of Experiments	30
Record	10
Mid-Term and Model Test Average	10
Total	50

PROJECT

Maximum marks: 50

There is no minimum pass mark for internal. But, if it is less than 50%, it should be compensated in the external.

Students will do the experiments and project work on a title approved by the respective project supervisor. Students will maintain daily records and present oral reports while doing project preparation. All the above process will be duly assessed by the project supervisor to award the internal mark.

16.2 External Assessment

THEORY

Maximum marks: 75

Passing minimum marks: 38

The external evaluation will be based on the examinations to be conducted by the University at the end of each semester.

Written Examination: Theory Paper (Bloom's Taxonomy based)

Question Paper Model

Intended Learning Skills	Maximum 75 Marks Passing Minimum: 50% Duration: Three Hours
Memory Recall / Example/ Counter Example / Knowledge about the Concepts/ Understanding	Part –A (15x 1 = 15 Marks) Answer ALL questions (Multiple choice questions) Three questions from each UNIT
Descriptions/ Application (Problems)	Part – B (5 x 4 = 20 Marks) Answer ALL the questions choosing either (a) or (b) [One Question from each Unit]
Analysis /Synthesis / Evaluation	Part-C (5 x 8 = 40 Marks) Answer ALL the questions choosing either (a) or (b) [One Question from each Unit]

Each question should carry the course outcome and cognitive level.

For instance,

1. [CO1: K2] Question xxxx

2. [CO3: K1] Question xxxx

PRACTICAL

Maximum marks: 50

Passing minimum marks: 25

Practical examinations will be conducted at the end of each semester. The scheme of valuation is to be decided by the respective board of Question setters.

PROJECT AND VIVA-VOCE

Maximum marks: 50

Passing minimum marks: 25

Note:

Scheme of evaluation of Project report includes choosing a universal problem, novelty of the title, purpose and importance of work for future development and methodology of writing the project report.

17. DIFFERENT TYPES OF COURSES

(i) Core Courses

(ii) Elective Courses (ED within the Department Experts)

(iii) Skill Development Courses

(iv) Institution-Industry-Interaction (Industry aligned Courses)

Programmes /course work/ field study/ Modelling the Industry Problem/ Statistical Analysis / Commerce-Industry related problems / MoU with Industry and the like activities.

Title of the Course	PHARMACEUTICAL CHEMISTRY						
Paper No.	Elective I – EC1						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Prerequisites	Basic knowledge on drugs and doses						
Objectives of the course	<p>To understand the advanced concepts of pharmaceutical chemistry.</p> <p>To recall the principle and biological functions of various drugs.</p> <p>To train the students to know the importance as well the consequences of various drugs.</p> <p>To familiarize on the drug dosage and its structural activities.</p>						
Course Outline	<p>UNIT-I: Physical properties in Pharmaceuticals: Physical properties of drug molecule: physical properties. Refractive index- Definition, explanation, formula, importance, determination, specific & molar refraction. Optical activity\rotation- monochromatic & polychromatic light, optical activity, angle of rotation, specific rotation examples, measurement of optical activity. Dielectric constant & Induced Polarization- Dielectric constant explanation & determination. Rheology of pharmaceutical systems: Introduction, Definition, Applications, concept of viscosity, Newton's law of flow, Kinematic, Relative, Specific, Reduced & Intrinsic viscosity. Newtonian system, non-Newtonian system- Plastic flow, Pseudoplastic flow, Dilatant flow. Viscosity measurements- selection of viscometer for Newtonian and non-Newtonian system.</p>						
	<p>UNIT-II: Isotopic Dilution analysis: principle and applications, Neutron activation analysis: Principle, advantages and limitations, Scintillation counters: Body scanning. Introduction to radiopharmaceuticals. Properties of various types of radiopharmaceuticals, Radiopharmaceuticals as diagnostics, as therapeutics, for research and sterilization. Physico Chemical Properties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.</p>						
	<p>UNIT-III: Drug dosage and product development: Introduction to Drug Dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies,</p>						

	<p>sources of drug, drug nomenclature, routes of administration of drug products, need for a dosage form, classification of dosage forms.</p> <p>UNIT-IV: Development of new drugs: Introduction, procedure followed in drug design, the research for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect, isosterism, bioisosterism, spatial considerations, biological properties of simple functional groups, theories of drug activity, occupancy theory, rate theory, induced-fit theory. Quantitative structure activity relationship (QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionization constants, steric parameters, chelation parameters, redox potential, indicator-variables.</p> <p>UNIT-V: Computers in Pharmaceutical Chemistry: Need of computers for chemistry. Computers for Analytical Chemists- Molecular Docking – Selection of binding protein – RCSB – Druglikeness of the ligand – ADMET properties – Detection using online servers – AutoDock Vina – Methods and Result analysis – Visualization of the Ligand-Protein interaction.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Physical Chemistry- Bahl and Tuli. 2. Text Book of Physical Pharmaceutics, IInd edition, Vallabh Prakashan-. C.V.S. Subramanyam. 3. Medicinal Chemistry (Organic Pharmaceutical Chemistry), G.R Chatwal, Himalaya Publishing house. 4. Instrumental method of Analysis: Hubert H, Willard, 7th edition. 5. Textbook of Pharmaceutical Chemistry by, Jayshree Ghosh, S. Chand & company Ltd. Pharmaceutical Chemistry by Dr. S. Lakshmi, Sultan chand & Sons.

Reference Books	<ol style="list-style-type: none"> 1. Computers in chemistry, K.V. Raman, Tata Mc.Graw-Hill, 1993. 2. Computers for Chemists, S.K Pundir, Anshu bansal, A pragate prakashan., 2 nd edition, New age international (P) limited, New Delhi. 3. Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins. 4. Cooper and Gunn's Tutorial Pharmacy ,6th edition by S.J. Carter, CBS Publisher Ltd. 5. Ansel's pharmaceutical Dosage forms and Drug Delivery System by Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd.
Website and e-learning source	https://www.ncbi.nlm.nih.gov/books/NBK482447/ https://training.seer.cancer.gov/treatment/chemotherapy/types.html
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To identify the suitable drugs for various diseases. CO2: To apply the principles of various drug action and drug design. CO3: To acquire the knowledge on product development based on SAR. CO4: To apply the knowledge on applications of computers in chemistry. CO5: To synthesize new drugs after understanding the concepts SAR.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level Of Correlation Between PSO's And CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	NANO MATERIALS AND NANO TECHNOLOGY					
Paper No.	Elective I – EC1					
Category	Elective	Year	I	Credits	3	Course Code
		Semester	I			
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
	4	1	-		5	
Prerequisites	Basic knowledge of crystallography and material science					
Objectives of the course	<p>To understand the concept of nano materials and nano technology.</p> <p>To understand the various types of nano materials and their properties.</p> <p>To understand the applications of synthetically important nano materials.</p> <p>To correlate the characteristics of various nano materials synthesized by new technologies.</p> <p>To design synthetic routes for synthetically used new nano materials.</p>					
Course Outline	UNIT-I: Introduction of nanomaterials and nanotechnologies:					
	Introduction-role of size, classification-0D, 1D, 2D, 3D. consolidation of Nano powders. Features of nanostructures, Background of nanostructures. Techniques of synthesis of nanomaterials- Bottom –Up, Top–Down, Tools of the nanoscience. Applications of nanomaterials and technologies.					
	UNIT-II: Synthetic Methods: Bonding and structure of the nanomaterials, Predicting the Type of Bonding in a Substance crystal structure. Metallic nanoparticles, Surfaces of Materials, Nanoparticle Size and Properties. Synthesis- Physical and chemical methods - inert gas condensation, arc discharge, laser ablation, sol-gel, solvothermal and hydrothermal-CVD-types, metallo organic, plasma enhanced, and low-pressure CVD. Microwave assisted and electrochemical synthesis.					
	UNIT-III: Mechanical Properties of Nanomaterials: Mechanical properties of materials, theories relevant to mechanical properties. Techniques to study mechanical properties of nanomaterials, adhesion and friction, thermal properties of nanomaterials Nanoparticles: gold and silver, metal oxides: silica, iron oxide and alumina - synthesis and properties.					
UNIT-IV: Electrical Properties of Nanomaterials: Electrical properties, Conductivity and Resistivity, Classification of Materials						

	<p>based on Conductivity, magnetic properties, electronic properties of materials. Classification of magnetic phenomena. Semiconductor materials – classification-Ge, Si, GaAs, SiC, GaN, GaP, CdS,PbS. Identification of materials as p and n –type semiconductor-Hall effect - quantum and anomalous, Hall voltage - interpretation of charge carrier density. Applications of semiconductors: p-n junction as transistors and rectifiers, photovoltaic and photogalvanic cell.</p> <p>UNIT-V: Nano Composites: Nano thin films, nanocomposites. Application of nanoparticles in different fields. Core-shell nanoparticles - types, synthesis, and properties. Nanocomposites - metal- ceramic- and polymer-matrix composites-applications.</p> <p>Characterization – SEM, TEM and AFM - principle, instrumentation and applications.</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. S.Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications,2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. S.Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications,2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction

	to Materials Science for Engineers. 6 th ed., PEARSON Press, 2007.
Website and e-learning source	1. http://xrayweb.chem.ou.edu/notes/symmetry.html . 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf .
Course Learning Outcomes (for Mapping with POs and PSOs)	
Students will be able:	
CO1: To explain methods of fabricating nanostructures.	
CO2: To relate the unique properties of nanomaterials to reduce dimensionality of the material.	
CO3: To describe tools for properties of nanostructures.	
CO4: To discuss applications of nanomaterials.	
CO5: To understand the health and safety related to nanomaterial.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	ELECTROCHEMISTRY						
Paper No.	Elective II - EC2						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Prerequisites	Basic knowledge of electrochemistry						
Objectives of the course	<p>To understand the behavior of electrolytes in terms of conductance, ionic atmosphere, interactions.</p> <p>To familiarize the structure of the electrical double layer of different models.</p> <p>To compare electrodes between current density and over potential.</p> <p>To discuss the mechanism of electrochemical reactions.</p> <p>To highlight the different types of over voltages and its applications in electroanalytical techniques.</p>						
Course Outline	<p>UNIT-I: Ionics: Arrhenius theory -limitations, Van't Hoff factor and its relation to colligative properties. Deviation from ideal behavior. Ionic activity, mean ionic activity and mean ionic activity coefficient-concept of ionic strength, Debye Huckel theory of strong electrolytes, activity coefficient of strong electrolytes Determination of activity coefficient ion - solvent and ion-ion interactions. Derivation of Debye-Huckel limiting law at appreciable concentration of electrolytes modifications and applications. Electrolytic conduction-Debye-Huckel Onsager treatment of strong electrolyte-qualitative and quantitative verification and limitations.</p>						
	<p>UNIT-II: Electrode-electrolyte interface: Interfacial phenomena - Evidences for electrical double layer, polarizable and non-polarizable interfaces, Electrocapillary phenomena - Lippmann equation electro capillary curves. Electro-kinetic phenomena electro-osmosis, electrophoresis, streaming and sedimentation potentials, colloidal and poly electrolytes. Structure of double layer: Helmholtz -Perrin, Guoy-Chapman and Stern models of electrical double layer. Zeta potential and potential at zero charge. Applications and limitations.</p>						
	<p>UNIT-III: Electrodicts of Elementary Electrode Reactions: Behavior of electrodes: Standard electrodes and electrodes at equilibrium. Anodic and Cathodic currents, condition for the discharge of ions. Nernst</p>						

	<p>equation, polarizable and non-polarizable electrodes. Model of three electrode system, over potential. Rate of electro chemical reactions: Rates of simple elementary reactions. Butler-Volmer equation and Tafel equation-significance of exchange current density, net current density and symmetry factor. Low and high field approximations. symmetry factor and transfer coefficient Tafel equations and Tafel plots.</p> <p>UNIT-IV: Electrodicts of Multistep Multi Electron System: Rates of multi-step electrode reactions. Rate determining step, electrode polarization and depolarization. Transfer coefficients, its significance and determination, Stoichiometric number. Reduction of I^3, Fe^{2+} and dissolution of Fe to Fe^{2+}. Overvoltage - Chemical and electro chemical, Phase, activation and concentration over potentials. Evolution of oxygen and hydrogen at different pH. Pourbiax and Evan's diagrams.</p> <p>UNIT-V: Concentration Polarization, Batteries and Fuel cells: Modes of Transport of electro active species - Diffusion, migration and hydrodynamic modes. Role of supporting electrolytes. Polarography-principle and applications. Cyclic voltammetry- anodic and cathodic stripping voltammetry and differential pulse voltammetry. Sodium and lithium-ion batteries and redox flow batteries.</p> <p>Energy production systems: Fuel Cells: classification, alkaline fuel cells, phosphoric acid fuel cells, high temperature fuel cells.</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. D. R. Crow, Principles and applications of electrochemistry, 4th edition, Chapman & Hall/CRC, 2014. 2. J. Rajaram and J.C. Kuriakose, Kinetics and Mechanism of chemical transformations Macmillan India Ltd., New Delhi, 2011. 3. S. Glasstone, Electro chemistry, Affiliated East-West Press, Pvt., Ltd., New Delhi, 2008.

	<ol style="list-style-type: none"> 4. B. Viswanathan, S. Sundaram, R. Venkataraman, K. Rengarajan and P.S. Raghavan, Electrochemistry-Principles and applications, S. Viswanathan Printers, Chennai, 2007. 5. Joseph Wang, Analytical Electrochemistry, 2nd edition, Wiley, 2004.
Reference Books	<ol style="list-style-type: none"> 1. J.O.M. Bockris and A.K.N. Reddy, Modern Electro chemistry, vol.1 and 2B, Springer, Plenum Press, New York, 2008. 2. J.O.M. Bockris, A.K.N. Reddy and M.G. Aldeco Morden Electro chemistry, vol. 2A, Springer, Plenum Press, New York, 2008. 3. Philip H. Rieger, Electrochemistry, 2nd edition, Springer, New York, 2010. 4. L.I. Antropov, Theoretical electrochemistry, Mir Publishers, 1977. 5. K.L. Kapoor, A Text book of Physical chemistry, volume-3, Macmillan, 2001.
Website and e-learning source	1. https://www.pdfdrive.com/modern-electrochemistry-e34333229 .
<p>Course Learning Outcomes (for Mapping with POs and PSOs)</p> <p>Students will be able:</p> <p>CO1: To understand the behaviour of electrolytes in solution and compare the structures of electrical double layer of different models.</p> <p>CO2: To predict the kinetics of electrode reactions applying Butler-Volmer and Tafel equations</p> <p>CO3: To study the mechanism of multi- step electrode reactions.</p> <p>CO4: To discuss the theories of electrolytes, electrical double layer, electrostatics and activity coefficient of electrolytes</p> <p>CO5: To have knowledge on storage devices and electrochemical reaction mechanism.</p>	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	MOLECULAR SPECTROSCOPY						
Paper No.	Elective II – EC2						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	4	1	-		5		
Prerequisites	Basic knowledge of spectroscopy						
Objectives of the course	<p>To understand the influence of rotation and vibrations on the spectra of the polyatomic molecules.</p> <p>To study the principle of Raman spectroscopy, ESR spectroscopy and fragmentation patterns in Mass spectroscopy.</p> <p>To highlight the significance of Franck-Condon principle to interpret the selection rule, intensity and types of electronic transitions.</p> <p>To interpret the first and second order NMR spectra in terms of splitting and coupling patterns using correlation techniques such as COSY, HETCOR, NOESY.</p> <p>To carry out the structural elucidation of molecules using different spectral techniques.</p>						
Course Outline	<p>UNIT-I: Rotational and Raman Spectroscopy: Rotational spectra of diatomic and polyatomic molecules. Intensities of rotational spectral lines, effect of isotopic substitution. Non-rigid rotators. Classical theory of the Raman effect, polarizability as a tensor, polarizability ellipsoids, quantum theory of the Raman effect, Pure rotational Raman spectra of linear and asymmetric top molecules, Stokes and anti-Stokes lines. Vibrational Raman spectra, Raman activity of vibrations, rule of mutual exclusion, rotational fine structure-Q and S branches, Polarization of Raman scattered photons.</p>						
	<p>UNIT-II: Vibrational Spectroscopy: Vibrations of molecules, harmonic and anharmonic oscillators- vibrational energy expression, energy level diagram, vibrational wave functions and their symmetry, selection rules, expression for the energies of spectral lines, computation of intensities, hot bands, effect of isotopic substitution. Diatomic vibrating rotor, vibrational-rotational spectra of diatomic molecules, P, R branches, breakdown of the Born-Oppenheimer approximation. Vibrations of polyatomic molecules – symmetry properties, overtone and combination frequencies. Influence of rotation</p>						

	<p>on vibrational spectra of polyatomic molecule, P, Q, R branches, parallel and perpendicular vibrations of linear and symmetric top molecules.</p>
	<p>UNIT-III: Electronic spectroscopy: Electronic Spectroscopy: Electronic spectroscopy of diatomic molecules, Frank-Condon principle, dissociation and predissociation spectra. $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ transitions and their selection rules. Photoelectron Spectroscopy: Basic principles, photoelectron spectra of simple molecules, X-ray photoelectron spectroscopy (XPS). Lasers: Laser action, population inversion, properties of laser radiation, examples of simple laser systems.</p>
	<p>UNIT-IV: NMR and Mass Spectrometry: Chemical shift, Factors influencing chemical shifts: electronegativity and electrostatic effects; Mechanism of shielding and deshielding. Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions: Homonuclear coupling interactions - AX, AX₂, AB types. Vicinal, germinal and long-range coupling-spin decoupling. Nuclear Overhauser effect (NOE), Factors influencing coupling constants and Relative intensities. ¹³C NMR and structural correlations – DEPT. Brief introduction to 2D NMR – COSY, NOESY and HETCOR. Introduction to ³¹P, ¹⁹F NMR. Mass Spectrometry: Mass Spectrometry: Ionization techniques- Electron ionization (EI), chemical ionization (CI), desorption ionization (FAB/MALDI), electrospray ionization (ESI), isotope abundance, molecular ion, fragmentation processes of organic molecules, deduction of structure through mass spectral fragmentation, high resolution. Effect of isotopes on the appearance of mass spectrum. Structural elucidation of organic compounds by combined spectral techniques.</p>
	<p>UNIT-V: ESR and Mossbauer Spectroscopy: ESR spectroscopy Characteristic features of ESR spectra, line shapes and line widths; ESR spectrometer. The g value and the hyperfine coupling parameter (A), origin of hyperfine interaction. Interpretation of ESR spectra and</p>

	<p>structure elucidation of organic radicals using ESR spectroscopy; Spin orbit coupling and significance of g-tensors, zero/non-zero field splitting, Kramer's degeneracy, application to transition metal complexes (having one to five unpaired electrons) including biological molecules and inorganic free radicals. ESR spectra of magnetically dilute samples.</p> <p>Principle of Mossbauer spectroscopy: Doppler shift, recoil energy. Isomer shift, quadrupole splitting, magnetic interactions. Applications: Mossbauer spectra of high and low-spin Fe and Sn compounds.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. C. N. Banwell and E. M. McCash, <i>Fundamentals of Molecular Spectroscopy</i>, 4th Ed., Tata McGraw Hill, New Delhi, 2000. 2. R. M. Silverstein and F. X. Webster, <i>Spectroscopic Identification of Organic Compounds</i>, 6th Ed., John Wiley & Sons, New York, 2003. 3. W. Kemp, <i>Applications of Spectroscopy</i>, English Language Book Society, 1987. 4. D. H. Williams and I. Fleming, <i>Spectroscopic Methods in Organic Chemistry</i>, 4th Ed., Tata McGraw-Hill Publishing Company, New Delhi, 1988. 5. R. S. Drago, <i>Physical Methods in Chemistry</i>; Saunders: Philadelphia, 1992.
Reference Books	<ol style="list-style-type: none"> 1. P.W. Atkins and J. de Paula, <i>Physical Chemistry</i>, 7th Ed., Oxford University Press, Oxford, 2002. 2. I. N. Levine, <i>Molecular Spectroscopy</i>, John Wiley & Sons, New York, 1974. 3. A. Rahman, <i>Nuclear Magnetic Resonance-Basic Principles</i>, Springer-Verlag, New York, 1986. 4. K. Nakamoto, <i>Infrared and Raman Spectra of Inorganic and coordination Compounds</i>, PartB: 5th ed., John Wiley & Sons Inc., New York, 1997. 5. J. A. Weil, J. R. Bolton and J. E. Wertz, <i>Electron Paramagnetic Resonance</i>; Wiley Interscience, 1994.
Website and e-learning source	<ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc20_cy08/preview 2. https://www.digimat.in/nptel/courses/video/104106122/L14.html

<p>Course Learning Outcomes (for Mapping with POs and PSOs)</p> <p>Students will be able:</p> <p>CO1: To understand the importance of rotational and Raman spectroscopy.</p> <p>CO2: To apply the vibrational spectroscopic techniques to diatomic and polyatomic molecules.</p> <p>CO3: To evaluate different electronic spectra of simple molecules using electronic spectroscopy.</p> <p>CO4: To outline the NMR, ¹³C NMR, 2D NMR – COSY, NOESY, Introduction to ³¹P, ¹⁹F NMR and ESR spectroscopic techniques.</p> <p>CO5: To develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques.</p>	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Title of the Course	MEDICINAL CHEMISTRY						
Paper No.	Elective III – EC3						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	3	1	-		4		
Prerequisites	Basic knowledge of medicinal chemistry						
Objectives of the course	To introduce the mechanism of drug action and drug delivery system To learn various types of drugs and their mode of action. To learn drug design and drug synthesis.						
Course Outline	UNIT-I: Introduction to receptors: Introduction, targets, Agonist, antagonist, partial agonist. Receptors, Receptor types, Theories of Drug – receptor interaction, Drug synergism, Drug resistance, physicochemical factors influencing drug action.						
	UNIT-II: Antibiotics: Introduction, Targets of antibiotics action, classification of antibiotics, enzyme-based mechanism of action, SAR of penicillins and tetracyclins, clinical application of penicillins, cephalosporin. Current trends in antibiotic therapy.						
	UNIT-III: Antihypertensive agents and diuretics: Classification of cardiovascular agents, introduction to hypertension, etiology, types, classification of antihypertensive agents, Synthesis of amyl nitrate, sorbitrate, diltiazem, quinidine, verapamil, methyldopa, atenolol. Classification and mechanism of action of diuretics, Furosemide, Hydrochlorothiazide, Amiloride.						
	UNIT-IV: Antineoplastic Agents Antineoplastic Agents: Introduction, cancer chemotherapy, special problems, role of alkylating agents and antimetabolites in treatment of cancer - Introduction of carcinolytic antibiotics and mitotic inhibitors - Synthesis of mechlorethamine, cyclophosphamide, melphalan, and uracil - Recent development in cancer chemotherapy.						
	UNIT-V: Analgesics, Anti-inflammatory and Antidiabetic Drugs: Introduction, Mechanism of inflammation, classification and mechanism of action and paracetamol, Ibuprofen, Diclofenac, naproxen, indomethacin, phenylbutazone and meperidine.						

	Antidiabetic Agents: Introduction, Types of diabetics, Drugs used for the treatment, chemical classification, Mechanism of action, Treatment of diabetic mellitus. Chemistry of insulin, sulfonyl urea.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, 2. Wilson, Charles Owens: Beale, John Marlowe; Block, John H, Lipincott William, 12th edition, 2011. 3. Graham L. Patrick, An Introduction to Medicinal Chemistry, 5th edition, Oxford University Press, 2013. Jayashree Ghosh, A text book of Pharmaceutical Chemistry, S. Chand and Co. Ltd, 1999, 1999 edn. 4. O. LeRoy, Natural and synthetic organic medicinal compounds, Ealemi, 1976. 5.S. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, New Delhi, 1993, New edn.
Reference Books	<ol style="list-style-type: none"> 1. Foye's Principles of Medicinal Chemistry, Lipincott Williams, Seventh Edition, 2012 2. Burger's Medicinal Chemistry, Drug Discovery and Development, Donald J. Abraham, David P. Rotella, Alfred Burger, Academic press, 2010. 3. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale Jr and John M. Block, Wolters Kluwer, 2011, 12th edn. 4. P. Parimoo, A Textbook of Medical Chemistry, New Delhi: CBS Publishers.1995. 5. S. Ramakrishnan, K. G. Prasannan and R. Rajan, Textbook of Medical Biochemistry, Hyderabad: Orient Longman. 3rd edition, 2001.
Website and e-learning source	<ol style="list-style-type: none"> 1. https://www.ncbi.nlm.nih.gov/books/NBK482447/ 2. https://training.seer.cancer.gov/treatment/chemotherapy/types.html 3. https://www.classcentral.com/course/swayam-medicinal-chemistry-

	12908
<p>Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To predict drugs properties based on its structure. CO2: To describe the factors that affect its absorption, distribution, metabolism, and excretion, and hence the considerations to be made in drug design. CO3: To explain the relationship between drug's chemical structure and its therapeutic properties. CO4: To give the knowledge of different theories of drug actions at molecular level. CO5: To identify different targets for the development of new drugs for the treatment of cancer.</p>	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Title of the Course	GREEN CHEMISTRY						
Paper No.	Elective III – EC3						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	3	1	-		4		
Prerequisites	Basic knowledge of general chemistry						
Objectives of the course	<p>To understand the basic principles of Green chemistry and Green techniques.</p> <p>To study Green catalysis and Green solvents.</p> <p>To propose solutions for pollution prevention in Industrial chemical and fuel production, Automotive industry and Shipping industries.</p> <p>To propose green solutions for industrial production of Organic and inorganic chemicals.</p>						
Course Outline	<p>UNIT-I: Basic Principles of Green Chemistry: Introduction- Need for Green Chemistry. Goals of Green Chemistry. Limitations of Green Chemistry. Chemical accidents, terminologies, International green chemistry organizations and Twelve principles of Green Chemistry with examples.</p>						
	<p>UNIT-II: Green Synthesis: Choice of starting materials, reagents, catalysts and solvents in detail, Green chemistry in day today life. Designing green synthesis-Green reagents: dimethyl carbonate. Green solvents: Water, Ionic liquids - criteria, general methods of preparation, effect on organic reaction. Supercritical carbon dioxide- properties, advantages, drawbacks and a few examples of organic reactions in scCO₂. Green synthesis-adipic acid and catechol.</p>						
	<p>UNIT-III: Green Catalysis: Environmental pollution, Green Catalysis- Acid catalysts, Oxidation catalysts, Basic catalysts, Polymer supported catalysts-Poly styrene aluminum chloride, polymeric super acid catalysts, Polymer supported photosensitizers.</p>						
	<p>UNIT-IV: Greener Reactions: Phase transfer catalysis in green synthesis-oxidation using hydrogen peroxide, crown ethers-esterification, saponification, anhydride formation, Elimination reaction, Displacement reaction. Applications in organic synthesis.</p>						

	UNIT-V: Green Techniques: Micro wave induced green synthesis - Introduction, Instrumentation, Principle and applications. Sonochemistry – Instrumentation, Cavitation theory - Ultra sound assisted green synthesis and Applications.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers, 2005. 2. W. L. McCabe, J.C. Smith and P. Harriott, Unit Operations of Chemical Engineering, 7th edition, McGraw-Hill, New Delhi, 2005. 3. J. M. Swan and D. St. C. Black, Organometallics in Organic Synthesis, Chapman Hall, 1974. 4. V. K. Ahluwalia and R. Aggarwal, Organic Synthesis: Special Techniques, Narosa Publishing House, New Delhi, 2001. 5. A. K. De, Environmental Chemistry, New Age Publications, 2017.
Reference Books	<ol style="list-style-type: none"> 1. Anastas, P.T. and Warner, J.K. Oxford Green Chemistry -Theory and Practical, University Press, 1998 2. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001 3. Cann, M.C. and Connely, M.E. Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000 4. Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, American Chemical Society Washington, 2002. 5. Chandrakanta Bandyopadhyay, An Insight into Green Chemistry, Books and Allied (P) Ltd, 2019.
Website and e-learning source	<ol style="list-style-type: none"> 2. https://www.organic-chemistry.org/ 3. https://www.studyorgo.com/summary.php
Course Learning Outcomes (for Mapping with POs and PSOs)	
Students will be able:	
CO1: To recall the basic chemical techniques used in conventional industrial preparations and in green innovations.	
CO2: To understand the various techniques used in chemical industries and in laboratory.	
CO3: To compare the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources.	
CO4: To apply the principles of PTC, ionic liquid, microwave and ultrasonic assisted organic	

synthesis.

CO5: To design and synthesize new organic compounds by green methods.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	BIO INORGANIC CHEMISTRY						
Paper No.	Elective IV – EC4						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	3	1	-		4		
Prerequisites	Basic knowledge of chemistry						
Objectives of the course	<p>To understand the role of trace elements.</p> <p>To understand the biological significance of iron and sulphur.</p> <p>To study the toxicity of metals in medicines.</p> <p>To have knowledge on diagnostic agents.</p> <p>To discuss on various metalloenzymes properties.</p>						
Course Outline	UNIT-I: Essential trace elements: Selective transport and storage of metal ions: Ferritin, Transferrin and siderophores; Sodium and potassium transport, Calcium signaling proteins. Metalloenzymes: Zinc enzymes–carboxypeptidase and carbonic anhydrase. Iron enzymes–catalase, peroxidase. Copper enzymes – superoxide dismutase, Plastocyanin, Ceruloplasmin, Tyrosinase. Coenzymes - Vitamin-B12 coenzymes.						
	UNIT-II: Transport Proteins: Oxygen carriers - Hemoglobin and myoglobin - Structure and oxygenation Bohr Effect. Binding of CO, NO, CN ⁻ to Myoglobin and Hemoglobin. Biological redox system: Cytochromes-Classification, cytochrome a, b and c. Cytochrome P-450. Non-heme oxygen carriers-Hemerythrin and hemocyanin. Iron-sulphur proteins- Rubredoxin and Ferredoxin- Structure and classification.						
	UNIT-III: Nitrogen fixation: Introduction, types of nitrogen fixing microorganisms. Nitrogenase enzyme - Metal clusters in nitrogenase- Transition metal complexes of dinitrogen - nitrogen fixation via nitride formation and reduction of dinitrogen to ammonia. Photosynthesis: photosystem-I and photosystem-II-chlorophylls structure and function.						
	UNIT-IV: Metals in medicine: Metal Toxicity of Hg, Cd, Zn, Pb, As, Sb. Therapeutic Compounds: Vanadium-Based Diabetes Drugs; Platinum-Containing Anticancer Agents. Chelation therapy; Cancer						

	<p>treatment. Diagnostic Agents: Technetium Imaging Agents; Gadolinium MRI Imaging Agents.</p> <p>UNIT-V: Enzymes - Introduction and properties - nomenclature and classification. Enzyme kinetics, free energy of activation and the effects of catalysis. Michelis - Menton equation - Effect of pH, temperature on enzyme reactions. Factors contributing to the efficiency of enzyme.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
Skills acquired from this course	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Williams,D.R. –Introduction to Bioinorganic chemistry. 2. F.M. Fiabre and D.R. Williams– The Principles of Bioinorganic Chemistry,RoyalSoceity of Chemistry, Monograph for Teachers-31 3. K.F. Purcell and Kotz., Inorganic chemistry, WB Saunders Co., USA. 4. G.N. Mugherjea and Arabinda Das, Elements of Bioinorganic Chemistry - 1993. 5. R. Gopalan, V. Ramalingam, <i>Concise Coordination Chemistry</i>, S. Chand, 2001.
Reference Books	<ol style="list-style-type: none"> 1. M.Satake and Y.Mido, Bioinorganic Chemistry- Discovery Publishing House, New Delhi (1996) 2. M.N. Hughes, 1982, The Inorganic Chemistry of Biological processes, II Edition, Wiley London. 3. R. W. Hay, Bio Inorganic Chemistry, Ellis Horwood, 1987. 4. R. M. Roat-Malone, Bio Inorganic Chemistry, John Wiley, 2002. 5. T. M. Loehr, Iron carriers and Iron proteins, VCH, 1989.
Website and e-learning source	<ol style="list-style-type: none"> 1. https://www.pdfdrive.com/instant-notes-in-inorganic-chemistry-the-instant-notes-chemistry-series-d162097454.html 2. https://www.pdfdrive.com/shriver-and-atkins-inorganic-chemistry-5th-edition-d161563417.html
Course Learning Outcomes (for Mapping with POs and PSOs)	
<p>Students will be able:</p> <p>CO1: To analyze trace elements.</p> <p>CO2: To explain the biological redox systems.</p> <p>CO3: To gain skill in analyzing the toxicity in metals.</p> <p>CO4: To get experience in diagnosis.</p>	

CO5: To explain nitrogen fixation and photosynthetic mechanism.
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CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 – Low

Title of the Course	MATERIAL SCIENCE						
Paper No.	Elective IV – EC4						
Category	Elective	Year	I	Credits	3	Course Code	
		Semester	II				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	3	1	-		4		
Prerequisites	Basic knowledge of solid-state chemistry						
Objectives of the course	<p>To understand the crystal structure, growth methods and X-ray scattering.</p> <p>To explain the optical, dielectric and diffusion properties of crystals.</p> <p>To recognize the basis of semiconductors, superconductivity materials and magnets.</p> <p>To learn about the importance of materials used for renewable energy conversion.</p>						
Course Outline	<p>UNIT-I: Crystallography: symmetry - unit cell and Miller indices - crystal systems - Bravais lattices - point groups and space groups - X-ray diffraction-Laue equations-Bragg's law-reciprocal lattice and its application to geometrical crystallography. Crystal structure–powder and single crystal applications. Electron charge density maps, neutron diffraction-method and applications.</p>						
	<p>UNIT-II: Crystal growth methods: Single crystal –Low and high temperature, solution growth– Gel and sol-gel. Crystal growth methods-nucleation– equilibrium stability and metastable state. Melt growth - Bridgeman-Stockbarger, Czochralski methods. Flux technique, physical and chemical vapour transport. Lorentz and polarization factor - primary and secondary extinctions.</p> <p>Characterization–TG/DTA/DSC methods, SEM/TEM Analysis. Determination of Hardness, Applications of Single Crystals.</p>						
	<p>UNIT-III: Properties of crystals: Optical studies - Electromagnetic spectrum (qualitative) refractive index – reflectance – transparency, translucency and opacity. Types of luminescence – photo-, electro-, and</p>						

	<p>injection luminescence, LEDs – organic, Inorganic and polymer LED materials - Applications. Dielectric studies- Polarisation - electronic, ionic, orientation, and space charge polarisation. Effect of temperature. dielectric constant, dielectric loss. Types of dielectric breakdown–intrinsic, thermal, discharge, electrochemical and defect breakdown.</p> <p>UNIT-IV: Special Materials: Superconductivity: Meissner effect, Critical temperature and critical magnetic Field, Type I and II superconductors, BCS theory-Cooper pair, Applications. Soft and hard magnets – Domain theory Hysteresis Loop-Applications. Magneto and giant magnetoresistance. Ferro, ferri and antiferromagnetic materials-applications, magnetic parameters for recording applications. Ferro-, Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications, Non-linear optics-Second Harmonic Generators, mixing of Laser wavelengths by quartz, ruby and LiNbO₃.</p> <p>UNIT-V: Materials for Renewable Energy Conversion: Solar Cells: Organic, bilayer, bulk heterojunction, polymer, perovskite based. Solar energy conversion: lamellar solids and thin films, dye-sensitized photo voltaic cells, coordination compounds anchored to semiconductor surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical activation and splitting of water, CO₂ and N₂. Manganese based photo systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - photochemical generation of hydrogen from alcohol.</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. S. Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications, 2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International

	Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Reference Books	1. Suggested Readings 1. M.G. Arora, Solid State Chemistry, Anmol Publications, New Delhi, 2001. 2. R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and Company Ltd, 2001. 3. C. Kittel, Solid State Physics, John-Wiley and sons, NY, 1966. 4. H.P. Meyers, Introductory Solid State Physics, Viva Books Private Limited, 1998. 5. A.R. West, Solid State Chemistry and Applications, John-Wiley and sons, 1987.
Website and e-learning source	1. http://xrayweb.chem.ou.edu/notes/symmetry.html . 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf . 3. https://bit.ly/3QyVg2R
Course Learning Outcomes (for Mapping with POs and PSOs)	
Students will be able: CO1: To understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets and renewable energy materials. CO2: To integrate and assess the structure of different materials and their properties. CO3: To analyse and identify new materials for energy applications. CO4: To explain the importance of crystal structures, piezoelectric and pyroelectric materials, nanomaterials, hard and soft magnets, superconductors, solar cells, electrodes, LED uses, structures and synthesis. CO5: To design and develop new materials with improved property for energy applications.	

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	S	S	S	S	M	S	S	S	S	M
CO 2	M	S	S	S	S	M	S	S	S	S
CO 3	S	S	M	S	S	S	S	M	S	S
CO 4	M	S	S	S	S	M	S	S	S	S
CO 5	M	S	M	S	S	M	S	M	S	S

3 – Strong, 2 – Medium, 1 – Low

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12
Affiliated colleges and Autonomous colleges

M.Phil. CHEMISTRY PROGRAM FROM THE ACADEMIC YEAR
2018-2019

Preamble

M.Phil is a research oriented program. After completing their Masters in Chemistry or equivalent will opt for pursuing research either directly or after completing the above program. The program is useful for research students to evaluate and identify the research problems which is related to social and economical valuable issues to the society.

Objectives

After studying the M.Phil. program, the students will be able to

- i. Introduce the purpose and importance of research for future development.
- ii. Know the different types of literature search and indexes.
- iii. Understand the error analysis, correlation methods and computer application
- iv. Enrich the knowledge in various types of spectral techniques and scientific analysis.
- v. Develop their skills for carryout the project
- vi. Make awareness in social and industrial relevant issues
- vii. Expose to present their findings in national and international seminars and conferences.

Outcome

After completing the M.Phil program the students will be able to

- i. Pursue research program
- ii. Qualify as Chemist/Scientist in various industries and research institutions

SEMESTER – I

Sl. No.	NAME OF COURSE	COURSE	
		Hrs/ week	Credits
1	Research and Teaching Methodology	4	4
2	Advance Scientific techniques in chemical analysis	4	4
3	Project oriented elective course	4	4

SEMESTER – II

4	Project work, dissertation and Viva- voce	-	12
Total			24

Paper III - Elective Paper- 1

ADVANCED TOPICS IN ORGANIC CHEMISTRY

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To learn the various reagents and their application in organic synthesis
2. To study the retro synthetic analysis
3. To understand the concept of linear free-energy relationships
4. To know about the biochemical activities of amino acids and proteins
5. To study on the nucleic acids structure and function

Unit I : Organic Reagents

(12hrs.)

Gilman's reagents – DCC – Grignard reagents – crown ethers – NBS – BF_3 complexes – SeO_2 – 1, 3-dithiane, tri-n-butyl tin hydride – phase transfer catalysts – Wilkinson's catalyst.

Unit II: Retro synthetic Analysis

(12hrs.)

Introduction to disconnections – one group disconnections – two group disconnections – peri cyclic reactions – Heteroatoms and heterocyclic compounds – small rings: three membered, four membered, and five membered.

Unit III: Advances in Linear Free-Energy Relationships

(12hrs.)

An introduction to linear free-energy relationships (LFER) – the Hammett equation – the duality of substituent constants and the Yukawa-Tasumo equation – the general validity of the Hammett equation – deviations from the Hammett equation in its various forms; the separation of polar, steric and resonance effects – Taft's equations; the ortho-effect; application of LFER to organic reactions; Influence of solvent on organic reactivity; the reactivity-selectivity principle.

UNIT IV: Amino Acids and Proteins

(12hrs.)

Structure and Classification – abbreviated names (1 letter and 3 letter) – Physical properties of amino acids – chemical properties – codons – Structure and importance of simple peptides like glutathione, Carnosine, anserine, vasopressin – Peptide antibiotics – gramicidin,

bacitracine, actinomycin D - Peptide synthesis – Acid chloride method – DCC method – Determination of primary structure of peptide – Identification of N-terminal amino acid – Barger's method – the DNP method – identification of C-terminal amino acid – Hierarchical representation of protein Primary, Secondary, tertiary and quaternary structures – Ramachandran plot.

UNIT V: Purine, Pyrimidine and Nucleic Acids

(12hrs.)

Structure of Purines, Pyrimidines – Nucleoside – ribonucleoside, deoxyribonucleosides – nucleotides – ribonucleotides – deoxyribonucleotides – structure and functions of DNA - Watson and Crick model of DNA- Structure of types of RNA (m-RNA, t-RNA and r-RNA) – Nucleases – structure and function of DNA and RNA – polynucleotide – cyclic nucleotide – structure and function of cAMP, cGMP nucleoprotein – Types of DNA (A-DNA, B-DNA, Z-DNA)

References:

1. Reaction Mechanism and Reagents in Organic Chemistry – Gurdeep R. Chatwal
2. Designing Organic Synthesis: A Programmed Introduction to the Synthon Approach – Stuart Warren
3. N.B. Chapman and J. Shorter, Eds., Advances in Linear Free-Energy Relationships, Plenum Press, London, 1972.
4. J. Shorter, Correlation Analysis in Organic Chemistry – An Introduction to Linear Free-Energy Relationships, Clarendon Press, Oxford, 1973.
5. N.B. Chapman and J. Shorter, Eds., Correlation Analysis in Chemistry-Recent Advances, Plenum Press, New York, 1978.
6. J. Shorter, Correlation Analysis of Organic Reactivity, Research Studies Press, England, 1982.
7. Biochemistry, Lehinger J.CB S.Publishers,1993.
8. Biochemistry, U. Satyanarayana & U. Chakrapani, Books & Allied Pvt. Ltd, 1999.
9. Biochemistry — Lubert Stryer – W. H. Freeman and company, 4th Edn., New York, 1995.

CHROMATOGRAPHY

No. of Hrs – 4 / Week

Credits - 4

Objectives

- 1. To understand the chromatographic basic principles*
- 2. To learn the thinlayer chromatographic techniques*
- 3. To understand about the ion exchange concepts*
- 4. To learn about the high performance liquid chromatography for organic analysis*
- 5. To study about the gas chromatography technique for volatile and gas molecule analysis*

UNIT I: Chromatography

(12hrs.)

Classification of Chromatography methods. Column Chromatography- Principles, experimental procedures, stationary and mobile phases, Choice of Solvent Systems, Separation techniques. Applications.

R_f values, Factors affecting R_f values, Experimental procedures, Choice of paper and solvent systems, developments of chromatogram. Detection of the spots. Ascending, Descending and Radial Paper Chromatography, Two Dimensional Chromatography –Applications.

UNIT II: THINLAYER CHROMATOGRAPHY

(12hrs.)

Principles, factors affecting R_f values. Experimental Procedures, Choice of adsorbents and Solvents. Preparation of plates, development of the Chromatogram. Detection of the spots, advantages of thin Layer Chromatography over paper chromatography and Applications.

UNIT III: ION EXCHANGE CHROMATOGRAPHY

(12hrs.)

Principle, ion exchange resins and their types- cation exchange resins, anion exchange resins, ion exchange equilibria, properties of ion exchange resins, ion exchange capacity and techniques – applications.

UNIT IV: HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (12hrs.)

Introduction, instrumentation, stationary and mobile Phases. Mobile Phase – Composition. Column – Preparation, Cleaning –regeneration and Storage Conditions. Retention time- Types of HPLC. Applications.

UNIT V: GAS CHROMATOGRAPHY (12hrs.)

Principle, instrumentation choice of injectors, column and detectors - Programmed temperature chromatography, flow programming chromatography, gas-solid chromatography, and hyphenated techniques in chromatography- Applications of Gas chromatography.

REFERENCES:

1. Fundamentals of Analytical Chemistry – D.A.Skoog, D.M. West, F.J. Holler and S.R. Crouch – 2004; Thompson Asia Private Ltd., Bangalore.
2. Instrumental Methods of Analysis – B. K. Sharma, 2003; Goel publishing House, Meerut.
3. Contemporary Chemical Analysis - Judith F. Rubinson, Prentice Hall (India).
4. Instrumental Methods of Analysis Hobart H. Willard, Lynne L. Merritt Jr, John Dean, Wadsworth Publishing Co Inc; 7th Edn., 1988.
5. Thin Layer Chromatography- A laboratory Handbook, Ashworth, Stahl. E., 1st Edn., Springer-Verlag, 1969.
6. Dynamics of Chromatography - Principles and Theory, J. Calvin Giddings, CRC Press, 2002.
7. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch, 2006.

Paper III -Elective Paper 3

ADVANCED TOPICS IN PHYSICAL CHEMISTRY

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. *To study about the concept of Photochemistry*
2. *To understand the principles about the chemical kinetics*
3. *To learn about the thermodynamics behavior of systems in chemistry*
4. *To understand the physical characteristics of biomolecules*
5. *To understand the various concept of Analytical techniques*

Unit I: Advanced Photochemistry (12hrs.)

Artificial photosynthesis and solar energy conversion – Photo electrochemical cells – dynamics of excited state processes (excited state energy, redox properties, emission lifetime and its temperature dependence) in micelles, reverse micelles and biomembranes – Fluorescence – quenching and anisotropy concepts; fluorescence sensing – mechanism and applications; Radioactive decay engineering – metal-enhanced fluorescence and surface Plasmon-coupled emission.

Unit – II: Advanced chemical kinetics (12hrs.)

Experimental methods for fast reactions- temperature jump, pressure jump stopped flow and flash photolysis – pulse technique – short tube kinetics.

NMR studies in rate process - Enzyme kinetics of complicated systems – theory of diffusion controlled reactions.

Unit – III: Irreversible thermodynamics (12hrs.)

Internal heat & entropy production – relation of entropy production with flux & forces – phenomenological equation – Prigogine's principle of minimum entropy production at non-equilibrium stationary state.

Unit – IV: Biophysical chemistry (12hrs.)

Biomembranes (structure & function) – Active transport & passive transport – multiple equilibria – specific examples of multiple equilibria – Transport processes – general features of transport processes optical systems of rht e study of transport processes – self organizing systems

– (Micelles, lipids, cyclodextrins, liquid crystals, reverse micelles) their interactions and solutions properties.

Unit – V: Analytical techniques

(12hrs.)

Thermal methods: TGA, DTA, DSC, Thermometric titration - Adsorption/desorption techniques: BET and EGME methods of determination of external and total surface area.

References:

1. K. Kalyanasundaram, Photochemistry in Microheterogeneous Systems, Academic Press, Orlando, 1987.
2. Extended irreversible thermodynamics – David Jon, Jose casas Vazques, 2012
3. Understanding Non-equilibrium Thermodynamics – Geogy Lebon, David Jon- 02008
4. Chemical kinetics: Fundamentals & New developments, E.T. Denisov, Ergenii tinofeerich , 2003
5. Chemical Kinetics, Laidler
6. Biophysical chemistry Alan Cooper – 2011
7. Biophysical chemistry, James P. Allen – 2008
8. Fundamentals of Analytical chemistry – Douglas A. Skoog Donal M. west 2013

Paper III -Elective Paper 4

ADSORPTION AND CATALYSIS

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To study about the various adsorption process connected with catalysis process
2. To study about the preparation methods of adsorbents
3. To evaluate the physico chemical properties of adsorbent by spectral studies
4. To study about the vapour phase and liquid phase catalysis and adsorption parameters
5. To learn about the adsorption isotherms and product analysis

Unit: I Adsorption & Catalysis

(12hrs.)

Concept of adsorption – types of adsorption, monolayer and multilayer adsorption. Adsorption - activation energy and temperature relationships, different between adsorption and catalysis, catalysis - homogeneous catalysis, heterogeneous catalysis, Acid -- base catalysis.

Unit: II Methods of preparation

(12hrs.)

Adsorbent - adsorbent preparation from plant materials, activated carbon preparation, synthetic adsorbent/catalyst - Molecular sieves – microporous & mesoporous molecular sieves – silicates, Aluminosilicates, Aluminophosphates – structure, acidic and basic sites.

Unit: III Spectral studies on Adsorbent

(12hrs.)

Characterization of adsorbent and catalyst - X-Ray Diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), Differential thermal analysis(DTA) , Nuclear magnetic resonance spectroscopy (NMR), Temperature programmed desorption (TPD), Electron spin resonance spectroscopy(ESR) Scanning electron microscopy(SEM), BET Surface Area, pore size analysis.

Unit: IV Reactions & Factors

(12hrs.)

Liquid phase - heterogeneous reaction conditions optimization - Temperature, pH, time and molar ratios. Vapor phase reaction, Regeneration of catalyst.

Adsorption – adsorption of dye molecules, metal ions, sugar molecules and other suitable molecules, conditions optimization – time, temperature, p^H , concentration and adsorbent dosage.

Unit: V Techniques

(12hrs.)

Product analysis in catalysis reactions – Gas chromatographic technique, conversion and product selectivity. Interpretation of adsorption parameters - Adsorption kinetics, adsorption isotherms and adsorption thermodynamics.

References:

1. Environmentally stable adsorbent of tetrahedral silica and non tetrahedral alumina for removal and recovery of malachite green dye from aqueous solution, *J. Hazardous materials*, 157 (2008) 137-145.
2. Plant poisoning organic dyes adsorption on tomato plant root and green carbon from aqueous solution, *Desalination*, 249 (2009) 1132-1138.
3. Film and pore diffusion modeling for the adsorption of direct red 81 on activated carbon prepared from balsamodendron caudatum wood waste, *Digest Journal of Nanomaterials and Biostructures*, Vol. 5, No 3, July 2010, p. 911 – 919
4. Plant toxic and non-toxic nature of organic dyes through adsorption mechanism on cellulose surface, *Journal of Hazardous materials*, 189 (2011) 294–300.
5. Adsorption of cationic and anionic organic dyes from aqueous solution using Silica, *J. Environmental Science and Engineering*, volume 52, No.4 (2010) 361-366
6. Hazardous dyes removal from aqueous solution over mesoporous aluminophosphate molecular sieves with textural porosity by adsorption, *Journal of Hazardous Materials* 244– 245 (2013) 10– 20.
7. A Simple Method for the Synthesis of Thermally Stable Large Pore Mesoporous Aluminophosphate Molecular Sieves, *Materials letters*, 113 (2013) 93–95.
8. Aniline methylation over AFI and AEL type molecular sieves, *App. Catal.*, Vol. 174, **1998**, 213.
9. Adsorptive removal of metanyl yellow on mesoporous Nickel aluminophosphate molecular sieves from aqueous solution, *Asian J. of chemistry*, vol. 24, no.12(2012), 5775-5778
10. Recent trends in catalysis, Narosa publication, 1st edition 2000.

Paper III -Elective Paper 5

NANOMATERIALS AND THEIR APPLICATIONS TO SOLAR ENERGY CONVERSION

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To study about the Nanomaterials
2. To study about the dye-sensitized solar cells
3. To learn about the Semiconductor and microemulsion (quantum dots)
4. To understand the Photochemistry and corrosion principles
5. To understand about the solar cell concepts

Unit I: Nanomaterials

(12hrs.)

Introduction to Nanoscience: Introduction- definition of Nanoscience, nanochemistry- classification of the nanomaterials

Synthesis of nanomaterials: Precipitative methods – hydrothermal and solvothermal methods - chemical methods - reduction methods – colloidal and micellar approach – sol-gel method – chemical vapor deposition method.

Specialized Nanomaterials: Metal oxide nanoparticles, semiconductor nanoparticles and core/shell nanoparticles

Unit II: Dye-sensitized solar cells

(12hrs.)

Solar energy conversion and storage – photo electrochemical cells – dye-sensitized solar cells – design and fabrication - power conversion efficiency

Use of metal and metal-free dye sensitizers in photovoltaic devices.

Unit III: Semiconductor and microemulsion (quantum dots)

(12hrs.)

Review of published literature – Water-soluble silica-coated semiconductor quantum dots – synthesis, characterization and properties.

Thickness-controllable silica coating of quantum dots – synthesis by microemulsion method and application in the growth of rice.

Unit IV: Photochemistry and corrosion

(12hrs.)

Review of published literature – Silica coated cadmium sulfide nanocomposites – synthesis, structure, optic and its photo catalytic properties.

Zirconia-coated carbonyl iron particles – synthesis and corrosion study.

Unit V : Solar cell

(12hrs.)

Review of published literature – Ruthenium (II) sensitizer in dye-sensitized solar cells using an organic dye as co-sensitizer – Fabrication and device characterization - photovoltaic performance.

Dye-sensitized solar cells - Co-sensitization strategy – electrochemical properties – Photo electrochemical performances – Electrochemical impedance spectroscopy – dark current measurement – Open-circuit voltage decay.

References

1. H. R. Allcock, Introduction to Materials Chemistry, John Wiley & Sons, Inc. Publication, 2008.
2. T. Pradeep, Nano: The Essentials, Tata Mc Graw-Hill, 2007.
3. A. Hagfeldt, *et al.* Chem. Rev., 2010, 110, pp. 6595–6663.
4. J. Gong, J. Liang, K. Sumathy, Renewable and Sustainable Energy Reviews, 2012, 16, 8, 5848-5860.
5. X. Chen, F. Liu, Q. Jiang, L. Sun, Q. Wang, J. Inorg. Organomet. Polym, 2012, 22:6-11.
6. A. Wang, Y. Zheng, F. Peng, J. Spectros. 2014, Article ID 169245, 1-5.
7. N. Gupta, B. Pal, J. Colloid and Int. Sci., 2010, 368, 250-256.
8. R. Chen et al. J. Colloid and Int. Sci., 2010, 342, 49-56.
9. U. Mehmood, I. A. Hussein, K. Harrabi, N. Tabet, G. R. Berdiyrov, RSC Adv., 2016, 6, 7897-7901.
10. L. Wei, Y. Na, Y. Yang, R. Fan, P. Wang, L. Li, Phys. Chem. Chem. Phys., 2015, 17, 1273-1280.

Paper III -Elective Paper 6

PHYTO-BIOSYNTHESIS AND APPLICATIONS OF METAL NANOPARTICLES

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To study about the Extraction and Isolation of natural products from Medicinal plants
2. To synthesis nanomaterial by using natural products
3. To understand the physico chemical properties of Nanoparticles
4. To utilize the nanoparticles for Biological Applications
5. To study the Nanoparticles application on Green catalysis

Unit I - Extraction and Isolation of some Indian Medicinal plants (12hrs.)

- i) Solid-Phase Extraction and LC–MS analysis of Pyrrolizidine Alkaloids in Honeys.
- ii) Comparative study of phytochemical screening, antioxidant and antimicrobial capacities of fresh and dry leaves crude plant extracts of *Datura metel* L.

Unit II – Biosynthesis of Metal Nanoparticles (12hrs.)

- i) Green synthesis of silver nanoparticles using *Ixora coccinea* leaves extract.
- ii) Ultrasmall Copper Nanoparticles Synthesized with a Plant Tea Reducing Agent.

Unit III – Characterization of Nanoparticles (12hrs.)

- i) Phytosynthesis of silver nanoparticles using *Coccinia grandis* leaf extract and its application in the photocatalytic degradation
- ii) A facile synthesis of high optical quality silver nanoparticles by ascorbic acid reduction in reverse micelles at room temperature.

Unit IV – Biological Applications of Nanoparticles (12hrs.)

- i) The green synthesis, characterization and evaluation of the biological activities of silver nanoparticles synthesized from *Iresine herbstii* leaf aqueous extracts
- ii) In vitro evaluation of antioxidant and anticancer potential of *Morinda pubescens* synthesized silver nanoparticles.

Unit V – Green catalytic activity of Nanoparticles (12hrs.)

- i) Catalytic Reduction of 4-Nitrophenol using Biogenic Gold and Silver Nanoparticles Derived from *Breynia rhamnoides*.
- ii) Catalytic degradation of organic dyes using biosynthesized silver nanoparticles.

References

1. K. A. Beales, K. Betteridge, S.M. Colegate, J.A. Edgar. *Journal of Agric. Food Chem.* 2015, 63, 7421–7427
2. Tahiya Hilal Ali Alabri, Amira Hamood Salim Al Musalami, Mohammad Amzad Hossain, Afaf Mohammed Weli, Qasim Al-Riyami. *Journal of King Saud University – Science* 2014, 26, 237–243
3. Muthu Karuppiah, Rangasamy Rajmohan. *Materials Letters* 97 (2013) 141–143.
4. Aaron D. Brumbaugh, Katelyn A. Cohen, and Sarah K. St. Angelo. *ACS Sustainable Chem. Eng.* 2014, 2, 1933–1939.
5. Rajeswari Arunachalam, Sujatha Dhanasingh, Balasaraswathi Kalimuthu, Mani Uthirappan, Chellan Rose, Asit Baran Mandal. *Colloids and Surfaces B: Biointerfaces* 94, 2012, 226-230
6. Debabrata Singha, Nabajeet Barman, Kalyanasis Sahu. *Journal of Colloid and Interface Science* 413 (2014) 37–42.
7. C. Dipankar, S. Murugan. *Colloids and Surfaces B: Biointerfaces* 98 (2012) 112– 119
8. L. Inbathamizh, T. Mekalai Ponnuru, E. Jancy Mary. *Journal of pharmacy research* 6 (2013) 32-38.
9. Abilash Gangula, Ramakrishna Podila, Ramakrishna M, Lohith Karanam, Chelli Janardhana, and Apparao M. Rao. *Langmuir* 2011, 27, 15268 – 15274.
10. V.K. Vidhu, D. Philip. *Micron* 56 (2014) 54–62.

DEPARTMENT OF CHEMISTRY
MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12
Ph.D. Course Work Papers

Sl. No.	Name of the Course	Credit
1	Analytical Methods And Instrumentation	4
2	Corrosion Science and Engineering	4
3	Research and Teaching Methodology	4
4	Advanced Scientific Techniques in Chemical Analysis	4
5	Advanced Topics in Organic Chemistry	4
6	Chromatography	4
7	Advanced Topics in Physical Chemistry	4
8	Adsorption and Catalysis	4
9	Nanomaterials And Their Applications To Solar Energy Conversion	4
10	Phyto-Biosynthesis and Applications of Metal Nanoparticles	4
11	Mini Project	4
12	Heterogenous Catalysis	4

Paper: I

ANALYTICAL METHODS AND INSTRUMENTATION

Hrs.– 60

Credit – 4

Objectives:

1. To understand the analytical data interpretation and result analysis.
2. To study about various chromatography technique for chemical analysis.
3. To study about the spectroscopic technique and instrumentation method of chemical analysis.

Unit-I Treatment of Analytical data and Interpretation (12hrs.)

Accuracy and Precision in measurements. Reliability of Analytical Data – Errors in Chemical analysis, Classification, Determination. Improving accuracy of analysis. Statistical analysis – Student t-test, F-test.

Unit-II Separation Technique (12hrs.)

Chromatographic techniques – paper, thin layer column chromatography, Gas Chromatography (GC)- Instrumentation, application. Principle and application of GCMS, LCMS, ion exchange chromatography. Flash Chromatography (FC) – Principle and application. Extraction Methods – Solvent extraction, Solid Phase extraction (SPE). Microwave Assisted Extraction (MAE), Soxhlet Extraction.

Unit- III Instrumental Methods of Chemical Analysis (12hrs.)

Atomic Absorption Spectroscopy (AAS) and Atomic Emission Spectroscopy (AES) – Principle Instrumentation and Application. X-ray Photoelectron Spectroscopy (XPS) – Theory and Instrumentation, XPS imaging, Surface analytical techniques – XRD, SEM, TEM – applications.

Unit-IV Spectroscopic Analysis (12hrs.)

UV-Vis and IR spectroscopy – UV-Vis spectra of enes, enones, arenes, and conjugated systems. Effect of solvent on UV-Vis spectra. IR- Principle, Instrumentation and Application. Characteristic group frequencies and functional group detection using IR.

Mass Spectroscopy (MS) – EI, CI, FAB, ESI and MALDI ion sources. Characteristic EIMS fragmentation and MS rearrangements. Spectral interpretation and structural determining using mass spectrum.

Unit-V NMR Spectroscopy and Structure elucidation

(12hrs.)

Basic Principle of NMR – H^1 and C^{13} Chemical Shift, spin-spin coupling, Coupling constant, J-value. Applications of NOE, DEPT and 2D techniques – COSY, HSQC and HSBC. Structure elucidation of organic compounds using spectral data – UV, IR, NMR and MS.

References:

1. Douglas A. Skoog, F James Holler; Stanley; R. Cruch, “Principle of instrumental analysis” Cole pub Co, (2006).
2. S.M. Khopkar, “ Basic Principles of Analytical Chemistry” 1st Edition, Wiley pub, (1984).
3. W. Kemp, “Organic Spectroscopy”, 3rd Edition, Palgrave Macmillan, (1991).
4. D.L. Pavia, G.M. Lampman and G.S. Kriz “ Introduction to Spectroscopy” 3rd Edition, Brooks/Cole, (2001).
5. D.H. Williams and I. Fleming “ Spectroscopic Methods in Organic Chemistry” 5th Edition, Macraw-Hill (1989).

Paper: II

CORROSION SCIENCE AND ENGINEERING

Hours : 60

Credits: 4

Objectives

1. To study the Principle and mechanism of electrochemical reactions involved in corrosion and preventive methods.
2. To gain knowledge on measurement of various adsorption and thermodynamic parameters related to corrosion.
3. To learn the basic terminology involved in electrochemical cell reaction and their application in some electrochemical based titration.
4. To understand the principles and working of some batteries and fuel cells. To impart knowledge on Classification, properties and uses of alloys.
5. To study the preparation, properties and applications of engineering materials.

Unit-1: Corrosion

(12 hrs)

Definition – causes - factors – types – chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – material selection and design aspect – electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints – constituent and function, Electroplating of copper and electroless plating of nickel

Unit-II: Non-Electrochemical methods

(12 hrs)

Adsorption - Physisorption – Chemisorption - Surface area determination - Mass loss measurements, Corrosion parameters Temperature studies – Adsorption - Temkin – Langmuir adsorption isotherm, Change in entropy, enthalpy, Gibbs free energy, Heat of adsorption, Activation energy - Green inhibitors.

Unit-III: Electrochemistry**(12 hrs)**

Electrochemical cell – redox reaction, electrode potential – origin of electrode potential – oxidation potential – reduction potential – electrochemical series and its significance – Nernst equation. Precipitation titration - Conductometric titration – Potentiometric titration – pH meter.

Unit-IV: Batteries, Fuel cells and Alloys**(12 hrs)**

Batteries - Types of batteries – alkaline battery – lead storage battery – nickel cadmium battery – lithium battery – Fuel cells – Hydrogen oxygen fuel cell.

Alloys: Introduction – Definition – Properties of alloys – Significance of alloying, Function and effects of alloying elements – Ferrous alloys – Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze.

Unit-V: Engineering Materials**(12 hrs)**

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth.

Refractories: definition, characteristics, classification properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity: Manufacture of alumina, magnesite and silicon carbide.

Reference:

1. R. Winston Revie and Herbert H. Uhlig “Corrosion and Corrosion control: An introduction to Corrosion Science and Engineering”, 4th Edition, John Wiley & Sons, Inc, 2008
2. Perez, Nestor “Electrochemistry and Corrosion Science”, 2nd Edition, Springer
3. Principles of Materials Science & Engineering, 2nd Edition by W. F. Smith, 1990
4. Robert G. Kelly, John R. Scully, David Shoesmith, Rudolph G. Buchheit
“Electrochemical Techniques in Corrosion Science and Engineering” 1st Edition, 2002
5. Volkan Cicek, Bayan Al-Numan “Corrosion Chemistry” Wiley
6. Pierre R. Roberge, “Handbook of Corrosion Engineering”, McGraw-Hill, 2005

7. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
8. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006.
9. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
10. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.
11. S.L.Chawla, R.K.Gupta, "Materials selection for corrosion control, First printing, Dec.1993.
12. P.H.Reiger, "Electrochemistry", Prentice Hall, 1987.
13. Mars G. Fontana, Corrosion Engineering, McGraw Hill Education, 3rd Edition
14. S. Glasstone, An introduction to Electrochemistry, Van Nostrand, New York, 1965.
15. A. J. Bard, L.R. Faulkner, Electrochemical Methods: Fundamentals and Applications, John Wiley and Sons, New York, 1980.
16. R. Crow, Principles and Applications of Electrochemistry, Chapman and Hall, London, 1979.
17. J. D. M. Bockris, A.K.N. Reddy, Modern Electrochemistry, Vol. I & II, Plenum Press, New York, 3rd Reprint, 1977.
18. Dr.A.Ravikrishnan, " Engineering chemistry – II" , Sri Krishna Hitech Publishing Company Pvt.Ltd, Updated edition, 2015-2016.
19. Dr.A.Ravikrishnan, " Engineering chemistry " , Sri Krishna Hitech Publishing Company Pvt.Ltd, Revised edition, 2017-2018.
20. P. C. Jain, Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 15th Edition, 2015.
21. Shasi Chawla, "Text Book of Engineering Chemistry", Dhantpat Rai Publishing Company, New Delhi, 1st Edition.
22. Dr. V. Veeraiyan and Dr. L. Devaraj Stephen, " Engineering chemistry – II" VRS Publishers Pvt.Ltd, 2015-2016.

Paper-IV

ADVANCED SCIENTIFIC TECHNIQUES IN CHEMICAL ANALYSIS

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To master the basic principles of spectroscopy to apply for structural elucidation.
2. To learn the methods of characterizing compounds by spectroscopic techniques.
3. To learn the various instrumental methods studying a given compound.
4. To learn the separation techniques for organic and inorganic compounds.
5. To learn about industrial analytical processes.

Unit –I : Absorption Spectroscopy

(12hrs.)

Infrared and Raman Spectroscopy: FT-IR, basic principles, quantitative IR, resonance Raman and laser Raman spectroscopy, applications of IR and Raman spectroscopy to organic and inorganic compounds.

Electronic Spectroscopy: term symbols, spin-orbit coupling in free ions, electronic spectra of O_h and T_d complexes, charge transfer transition, structural evidence from electronic spectra.

Unit II: Applications of Advanced Organic Spectroscopy

(12hrs.)

NMR: Basic principles of two-dimensional NMR spectroscopy – HOMOCOSY, HETCOSY and NOESY spectra and their applications – use of INEPT and DEPT methods and their applications.

Mass: Molecular ions, isotope peaks, fragmentation pattern – McLafferty rearrangement - measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI) – M^{+1} and M^{+2} ions – calculation of molecular formula from P_{M+1} and P_{M+2}

Road-map problems covering UV, IR, $^1\text{H-NMR}$, $^{13}\text{C-NMR}$ and mass spectral data.

Unit-III: Spectroscopy

(12hrs.)

Nuclear Quadruple Resonance Spectroscopy: effect of magnetic field on the spectra, electric field gradient and molecular structure, structural elucidation of inorganic and coordination compounds.

Electron Paramagnetic Resonance Spectroscopy: hyperfine splitting in isotropic systems; epr spectra of systems with more than one unpaired electrons-Kramer's degeneracy, zero field

splitting, epr of triplet states, anisotropy in *g*-value, anisotropy in hyperfine splitting, nuclear quadrupleinteraction; applications of epr to organic and inorganic compounds.

Mossbauer Spectroscopy: interpretation of isomer shifts, quadruple and magnetic interactions, Mossbauer emission spectroscopy, structural elucidation.

Unit IV: Diffraction & Surface Techniques: (12hrs.)

Principles and applications of XRD, Neutron and electron diffraction – Scanning electron microscopy (SEM)- Instrumentation – applications – surface area analysis, particle size determination – Scanning Probe Microscopes – Scanning Tunneling Microscopes – Atomic force microscopes (AFM) – Principle & applications.

Unit V: Electrochemical Techniques (12hrs.)

Polarography – Chronopotentiometry – Chronoamperometry – chronocontometry- Linear Potential Sweep voltametry – Cyclic Voltametry – ImpendenceMeasurements – AC Voltametry – Principles and their applications.

References:

1. Introduction to Nanoscience- Gabor. L, Hornyak. Joydeep Dutta CRC Press 2008.
2. L. Antropov, Theoretical Electrochemistry, Mir Publication, Moscow, 1972.
3. D.A. Skoog and J.J. Leary, Principles of Instrumental Analysis, 4th Edn., Saunders College Publishing, 1992.
4. D.A. Skoog, F.S.Holler, S.R.Crouch, Principles of Instrumental Analysis, 6th Edn., Thomson Brooks/cole, 2007.
5. A.K. Cheetham, P.Day, Solid State Chemistry: Techniques, Oxford University Press, Oxford, 1987.
6. G. E. Bacon, Neutron diffraction, Oxford Universtiy Press, Oxford, 1975.
7. R.S. Drago, Physical Methods in Chemistry, Saunders, 1999.
8. Spectrometric Identification of Organic Comounds – Silverstein, Bassler and Morrill.
9. Organic Spectroscopy – William Kemp

Paper V

ADVANCED TOPICS IN ORGANIC CHEMISTRY

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To learn the various reagents and their application in organic synthesis
2. To study the retro synthetic analysis
3. To understand the concept of linear free-energy relationships
4. To know about the biochemical activities of amino acids and proteins
5. To study on the nucleic acids structure and function

Unit I: Organic Reagents

(12hrs.)

Gilman's reagents – DCC – Grignard reagents – crown ethers – NBS – BF_3 complexes – SeO_2 – 1, 3-dithiane, tri-n-butyl tin hydride – phase transfer catalysts – Wilkinson's catalyst.

Unit II: Retro synthetic Analysis

(12hrs.)

Introduction to disconnections – one group disconnections – two group disconnections – peri cyclic reactions – Heteroatoms and heterocyclic compounds – small rings: three membered, four membered, and five membered.

Unit III: Advances in Linear Free-Energy Relationships

(12hrs.)

An introduction to linear free-energy relationships (LFER) – the Hammett equation – the duality of substituent constants and the Yukawa-Tasumo equation – the general validity of the Hammett equation – deviations from the Hammett equation in its various forms; the separation of polar, steric and resonance effects – Taft's equations; the ortho-effect; application of LFER to organic reactions; Influence of solvent on organic reactivity; the reactivity-selectivity principle.

UNIT IV: Amino Acids and Proteins

(12hrs.)

Structure and Classification – abbreviated names (1 letter and 3 letter) – Physical properties of amino acids – chemical properties – codons – Structure and importance of simple peptides like glutathione, Carnosine, anserine, vasopressin – Peptide antibiotics – gramicidin,

bacitracine, actinomycin D - Peptide synthesis – Acid chloride method – DCC method – Determination of primary structure of peptide – Identification of N-terminal amino acid – Barger's method – the DNP method – identification of C-terminal amino acid – Hierarchical representation of protein Primary, Secondary, tertiary and quaternary structures – Ramachandran plot.

UNIT V: Purine, Pyrimidine and Nucleic Acids

(12hrs.)

Structure of Purines, Pyrimidines – Nucleoside – ribonucleoside, deoxyribonucleosides – nucleotides – ribonucleotides – deoxyribonucleotides – structure and functions of DNA - Watson and Crick model of DNA- Structure of types of RNA (m-RNA, t-RNA and r-RNA) – Nucleases – structure and function of DNA and RNA – polynucleotide – cyclic nucleotide – structure and function of cAMP, cGMP nucleoprotein – Types of DNA (A-DNA, B-DNA, Z-DNA)

References:

1. Reaction Mechanism and Reagents in Organic Chemistry – Gurdeep R. Chatwal
2. Designing Organic Synthesis: A Programmed Introduction to the Synthron Approach – Stuart Warren
3. N.B. Chapman and J. Shorter, Eds., Advances in Linear Free-Energy Relationships, Plenum Press, London, 1972.
4. J. Shorter, Correlation Analysis in Organic Chemistry – An Introduction to Linear Free-Energy Relationships, Clarendon Press, Oxford, 1973.
5. N.B. Chapman and J. Shorter, Eds., Correlation Analysis in Chemistry-Recent Advances, Plenum Press, New York, 1978.
6. J. Shorter, Correlation Analysis of Organic Reactivity, Research Studies Press, England, 1982.
7. Biochemistry, Lehinger J.CB S.Publishers,1993.
8. Biochemistry, U. Satyanarayana & U. Chakrapani, Books & Allied Pvt. Ltd, 1999.
9. Biochemistry — Lubert Stryer – W. H. Freeman and company, 4th Edn., New York, 1995.

CHROMATOGRAPHY

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. *To understand the chromatographic basic principles*
2. *To learn the thinlayer chromatographic techniques*
3. *To understand about the ion exchange concepts*
4. *To learn about the high performance liquid chromatography for organic analysis*
5. *To study about the gas chromatography technique for volatile and gas molecule analysis*

UNIT I: Chromatography

(12hrs.)

Classification of Chromatography methods. Column Chromatography- Principles, experimental procedures, stationary and mobile phases, Choice of Solvent Systems, Separation techniques. Applications.

R_f values, Factors affecting R_f values, Experimental procedures, Choice of paper and solvent systems, developments of chromatogram. Detection of the spots. Ascending, Descending and Radial Paper Chromatography, Two Dimensional Chromatography –Applications.

UNIT II: THINLAYER CHROMATOGRAPHY

(12hrs.)

Principles, factors affecting R_f values. Experimental Procedures, Choice of adsorbents and Solvents. Preparation of plates, development of the Chromatogram. Detection of the spots, advantages of thin Layer Chromatography over paper chromatography and Applications.

UNIT III: ION EXCHANGE CHROMATOGRAPHY

(12hrs.)

Principle, ion exchange resins and their types- cation exchange resins, anion exchange resins, ion exchange equilibria, properties of ion exchange resins, ion exchange capacity and techniques – applications.

UNIT IV: HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (12hrs.)

Introduction, instrumentation, stationary and mobile Phases. Mobile Phase – Composition. Column – Preparation, Cleaning –regeneration and Storage Conditions. Retention time- Types of HPLC. Applications.

UNIT V: GAS CHROMATOGRAPHY (12hrs.)

Principle, instrumentation choice of injectors, column and detectors - Programmed temperature chromatography, flow programming chromatography, gas-solid chromatography, and hyphenated techniques in chromatography- Applications of Gas chromatography.

REFERENCES:

1. Fundamentals of Analytical Chemistry – D.A.Skoog, D.M. West, F.J. Holler and S.R. Crouch – 2004; Thompson Asia Private Ltd., Bangalore.
2. Instrumental Methods of Analysis – B. K. Sharma, 2003; Goel publishing House, Meerut.
3. Contemporary Chemical Analysis - Judith F. Rubinson, Prentice Hall (India).
4. Instrumental Methods of Analysis Hobart H. Willard, Lynne L. Merritt Jr, John Dean, Wadsworth Publishing Co Inc; 7th Edn., 1988.
5. Thin Layer Chromatography- A laboratory Handbook, Ashworth, Stahl. E., 1st Edn., Springer-Verlag, 1969.
6. Dynamics of Chromatography - Principles and Theory, J. Calvin Giddings, CRC Press, 2002.
7. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch, 2006.

Paper VII

ADVANCED TOPICS IN PHYSICAL CHEMISTRY

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. *To study about the concept of Photochemistry*
2. *To understand the principles about the chemical kinetics*
3. *To learn about the thermodynamics behavior of systems in chemistry*
4. *To understand the physical characteristics of biomolecules*
5. *To understand the various concept of Analytical techniques*

Unit I: Advanced Photochemistry (12hrs.)

Artificial photosynthesis and solar energy conversion – Photo electrochemical cells – dynamics of excited state processes (excited state energy, redox properties, emission lifetime and its temperature dependence) in micelles, reverse micelles and biomembranes – Fluorescence – quenching and anisotropy concepts; fluorescence sensing – mechanism and applications; Radioactive decay engineering – metal-enhanced fluorescence and surface Plasmon-coupled emission.

Unit – II: Advanced chemical kinetics (12hrs.)

Experimental methods for fast reactions- temperature jump, pressure jump stopped flow and flash photolysis – pulse technique – short tube kinetics.

NMR studies in rate process - Enzyme kinetics of complicated systems – theory of diffusion controlled reactions.

Unit – III: Irreversible thermodynamics (12hrs.)

Internal heat & entropy production – relation of entropy production with flux & forces – phenomenological equation – Prigogine's principle of minimum entropy production at non-equilibrium stationary state.

Unit – IV: Biophysical chemistry (12hrs.)

Biomembranes (structure & function) – Active transport & passive transport – multiple equilibria – specific examples of multiple equilibria – Transport processes – general features of transport processes optical systems of the study of transport processes – self organizing systems

– (Micelles, lipids, cyclodextrins, liquid crystals, reverse micelles) their interactions and solutions properties.

Unit – V: Analytical techniques

(12hrs.)

Thermal methods: TGA, DTA, DSC, Thermometric titration - Adsorption/desorption techniques: BET and EGME methods of determination of external and total surface area.

References:

1. K. Kalyanasundaram, Photochemistry in Microheterogeneous Systems, Academic Press, Orlando, 1987.
2. Extended irreversible thermodynamics – David Jon, Jose casas Vazques, 2012
3. Understanding Non-equilibrium Thermodynamics – Geogy Lebon, David Jon- 02008
4. Chemical kinetics: Fundamentals & New developments, E.T. Denisov, Ergenii tinofeerich , 2003
5. Chemical Kinetics, Laidler
6. Biophysical chemistry Alan Cooper – 2011
7. Biophysical chemistry, James P. Allen – 2008
8. Fundamentals of Analytical chemistry – Douglas A. Skoog Donal M. west 2013

Paper VIII

ADSORPTION AND CATALYSIS

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To study about the various adsorption process connected with catalysis process
2. To study about the preparation methods of adsorbents
3. To evaluate the physico chemical properties of adsorbent by spectral studies
4. To study about the vapour phase and liquid phase catalysis and adsorption parameters
5. To learn about the adsorption isotherms and product analysis

Unit: I Adsorption & Catalysis

(12hrs.)

Concept of adsorption – types of adsorption, monolayer and multilayer adsorption. Adsorption - activation energy and temperature relationships, different between adsorption and catalysis, catalysis - homogeneous catalysis, heterogeneous catalysis, Acid -- base catalysis.

Unit: II Methods of preparation

(12hrs.)

Adsorbent - adsorbent preparation from plant materials, activated carbon preparation, synthetic adsorbent/catalyst - Molecular sieves – microporous & mesoporous molecular sieves – silicates, Aluminosilicates, Aluminophosphates – structure, acidic and basic sites.

Unit: III Spectral studies on Adsorbent

(12hrs.)

Characterization of adsorbent and catalyst - X-Ray Diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), Differential thermal analysis(DTA) , Nuclear magnetic resonance spectroscopy (NMR), Temperature programmed desorption (TPD), Electron spin resonance spectroscopy(ESR) Scanning electron microscopy(SEM), BET Surface Area, pore size analysis.

Unit: IV Reactions & Factors

(12hrs.)

Liquid phase - heterogeneous reaction conditions optimization - Temperature, pH, time and molar ratios. Vapor phase reaction, Regeneration of catalyst.

Adsorption – adsorption of dye molecules, metal ions, sugar molecules and other suitable molecules, conditions optimization – time, temperature, p^H , concentration and adsorbent dosage.

Product analysis in catalysis reactions – Gas chromatographic technique, conversion and product selectivity. Interpretation of adsorption parameters - Adsorption kinetics, adsorption isotherms and adsorption thermodynamics.

References:

1. Environmentally stable adsorbent of tetrahedral silica and non tetrahedral alumina for removal and recovery of malachite green dye from aqueous solution, *J. Hazardous materials*, 157 (2008) 137-145.
2. Plant poisoning organic dyes adsorption on tomato plant root and green carbon from aqueous solution, *Desalination*, 249 (2009) 1132-1138.
3. Film and pore diffusion modeling for the adsorption of direct red 81 on activated carbon prepared from balsamodendron caudatum wood waste, *Digest Journal of Nanomaterials and Biostructures*, Vol. 5, No 3, July 2010, p. 911 – 919
4. Plant toxic and non-toxic nature of organic dyes through adsorption mechanism on cellulose surface, *Journal of Hazardous materials*, 189 (2011) 294–300.
5. Adsorption of cationic and anionic organic dyes from aqueous solution using Silica, *J. Environmental Science and Engineering*, volume 52, No.4 (2010) 361-366
6. Hazardous dyes removal from aqueous solution over mesoporous aluminophosphate molecular sieves with textural porosity by adsorption, *Journal of Hazardous Materials* 244– 245 (2013) 10– 20.
7. A Simple Method for the Synthesis of Thermally Stable Large Pore Mesoporous Aluminophosphate Molecular Sieves, *Materials letters*, 113 (2013) 93–95.
8. Aniline methylation over AFI and AEL type molecular sieves, *App. Catal.*, Vol. 174, **1998**, 213.
9. Adsorptive removal of metanyl yellow on mesoporous Nickel aluminophosphate molecular sieves from aqueous solution, *Asian J. of chemistry*, vol. 24, no.12(2012), 5775-5778
10. Recent trends in catalysis, Narosa publication, 1st edition 2000.

Paper IX

NANOMATERIALS AND THEIR APPLICATIONS TO SOLAR ENERGY CONVERSION

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. *To study about the Nanomaterials*
2. *To study about the dye-sensitized solar cells*
3. *To learn about the Semiconductor and microemulsion (quantum dots)*
4. *To understand the Photochemistry and corrosion principles*
5. *To understand about the solar cell concepts*

Unit I: Nanomaterials

(12hrs.)

Introduction to Nanoscience: Introduction- definition of Nanoscience, nanochemistry- classification of the nanomaterials

Synthesis of nanomaterials: Precipitative methods – hydrothermal and solvothermal methods - chemical methods - reduction methods – colloidal and micellar approach – sol-gel method – chemical vapor deposition method.

Specialized Nanomaterials: Metal oxide nanoparticles, semiconductor nanoparticles and core/shell nanoparticles

Unit II: Dye-sensitized solar cells

(12hrs.)

Solar energy conversion and storage – photo electrochemical cells – dye-sensitized solar cells – design and fabrication - power conversion efficiency

Use of metal and metal-free dye sensitizers in photovoltaic devices.

Unit III: Semiconductor and microemulsion (quantum dots)

(12hrs.)

Review of published literature – Water-soluble silica-coated semiconductor quantum dots – synthesis, characterization and properties.

Thickness-controllable silica coating of quantum dots – synthesis by microemulsion method and application in the growth of rice.

Unit IV: Photochemistry and corrosion

(12hrs.)

Review of published literature – Silica coated cadmium sulfide nanocomposites – synthesis, structure, optic and its photo catalytic properties.

Zirconia-coated carbonyl iron particles – synthesis and corrosion study.

Unit V :Solar cell

(12hrs.)

Review of published literature – Ruthenium (II) sensitizer in dye-sensitized solar cells using an organic dye as co-sensitizer – Fabrication and device characterization - photovoltaic performance.

Dye-sensitized solar cells - Co-sensitization strategy – electrochemical properties – Photo electrochemical performances – Electrochemical impedance spectroscopy – dark current measurement – Open-circuit voltage decay.

References

1. H. R. Allcock, Introduction to Materials Chemistry, John Wiley & Sons, Inc. Publication, 2008.
2. T. Pradeep, Nano: The Essentials, Tata Mc Graw-Hill, 2007.
3. A. Hagfeldt, *et al.* Chem. Rev., 2010, 110, pp. 6595–6663.
4. J. Gong, J. Liang, K. Sumathy, Renewable and Sustainable Energy Reviews, 2012, 16, 8, 5848-5860.
5. X. Chen, F. Liu, Q. Jiang, L. Sun, Q. Wang, J. Inorg. Organomet. Polym, 2012, 22:6-11.
6. A. Wang, Y. Zheng, F. Peng, J. Spectros. 2014, Article ID 169245, 1-5.
7. N. Gupta, B. Pal, J. Colloid and Int. Sci., 2010, 368, 250-256.
8. R. Chen et al. J. Colloid and Int. Sci., 2010, 342, 49-56.
9. U. Mehmood, I. A. Hussein, K. Harrabi, N. Tabet, G. R. Berdiyrov, RSC Adv., 2016, 6, 7897-7901.
10. L. Wei, Y. Na, Y. Yang, R. Fan, P. Wang, L. Li, Phys. Chem. Chem. Phys., 2015, 17, 1273-1280.

Paper X

PHYTO-BIOSYNTHESIS AND APPLICATIONS OF METAL NANOPARTICLES

No. of Hrs – 4 / Week

Credits - 4

Objectives

1. To study about the Extraction and Isolation of natural products from Medicinal plants
2. To synthesis nanomaterial by using natural products
3. To understand the physico chemical properties of Nanoparticles
4. To utilize the nanoparticles for Biological Applications
5. To study the Nanoparticles application on Green catalysis

Unit I - Extraction and Isolation of some Indian Medicinal plants (12hrs.)

- i) Solid-Phase Extraction and LC–MS analysis of Pyrrolizidine Alkaloids in Honeys.
- ii) Comparative study of phytochemical screening, antioxidant and antimicrobial capacities of fresh and dry leaves crude plant extracts of *Datura metel* L.

Unit II – Biosynthesis of Metal Nanoparticles (12hrs.)

- i) Green synthesis of silver nanoparticles using *Ixora coccinea* leaves extract.
- ii) Ultrasmall Copper Nanoparticles Synthesized with a Plant Tea Reducing Agent.

Unit III – Characterization of Nanoparticles (12hrs.)

- i) Phytosynthesis of silver nanoparticles using *Coccinia grandis* leaf extract and its application in the photocatalytic degradation
- ii) A facile synthesis of high optical quality silver nanoparticles by ascorbic acid reduction in reverse micelles at room temperature.

Unit IV – Biological Applications of Nanoparticles (12hrs.)

- i) The green synthesis, characterization and evaluation of the biological activities of silver nanoparticles synthesized from *Iresine herbstii* leaf aqueous extracts
- ii) In vitro evaluation of antioxidant and anticancer potential of *Morinda pubescens* synthesized silver nanoparticles.

Unit V – Green catalytic activity of Nanoparticles (12hrs.)

- i) Catalytic Reduction of 4-Nitrophenol using Biogenic Gold and Silver Nanoparticles Derived from *Breynia rhamnoides*.
- ii) Catalytic degradation of organic dyes using biosynthesized silver nanoparticles.

References

1. K. A. Beales, K. Betteridge, S.M. Colegate, J.A. Edgar. *Journal of Agric. Food Chem.* 2015, 63, 7421–7427
2. Tahiya Hilal Ali Alabri, Amira Hamood Salim Al Musalami, Mohammad Amzad Hossain, Afaf Mohammed Weli, Qasim Al-Riyami. *Journal of King Saud University – Science* 2014, 26, 237–243
3. Muthu Karuppiyah, Rangasamy Rajmohan. *Materials Letters* 97 (2013) 141–143.
4. Aaron D. Brumbaugh, Katelyn A. Cohen, and Sarah K. St. Angelo. *ACS Sustainable Chem. Eng.* 2014, 2, 1933–1939.
5. Rajeswari Arunachalam, Sujatha Dhanasingh, Balasaraswathi Kalimuthu, Mani Uthirappan, Chellan Rose, Asit Baran Mandal. *Colloids and Surfaces B: Biointerfaces* 94, 2012, 226-230
6. Debabrata Singha, Nabajeet Barman, Kalyanasis Sahu. *Journal of Colloid and Interface Science* 413 (2014) 37–42.
7. C. Dipankar, S. Murugan. *Colloids and Surfaces B: Biointerfaces* 98 (2012) 112– 119
8. L. Inbathamizh, T. Mekalai Ponnu, E. Jancy Mary. *Journal of pharmacy research* 6 (2013) 32-38.
9. Abilash Gangula, Ramakrishna Podila, Ramakrishna M, Lohith Karanam, Chelli Janardhana, and Apparao M. Rao. *Langmuir* 2011, 27, 15268 – 15274.
10. V.K. Vidhu, D. Philip. *Micron* 56 (2014) 54–62.

Objectives

- 1. To Learn about the porous materials**
- 2. To Understand the concept of metal doping and photocatalytic function of the material.**
- 3. To study the catalytic and photocatalytic activity of the materials.**

Unit I

Zeolite-based photocatalysts - Zeolites and molecular sieves acting as hosts for photoactive guests - Electron donor photosensitisers - organic dye - electron acceptor photosensitisers - Zeolites encapsulating clusters of semiconductor oxides - Zeolites having photocatalytically active framework.

Efficient photocatalytic degradation of organics diluted in water and air using TiO₂ designed with zeolites and mesoporous silica materials.

Unit II

Effect of metal-doping of TiO₂ nanoparticles on their photocatalytic activities toward removal of organic dyes.

Solar photocatalytic degradation of phenol using nanosized ZnO and α -Fe₂O₃.

Unit III

Network Structured SnO₂/ZnO Heterojunction Nanocatalyst with High Photocatalytic Activity.

Green synthesis of copper nanoparticles for the efficient removal (degradation) of dye from aqueous phase.

Unit IV

Visible Light Photodegradation of Phenol Using Nanoscale TiO₂ and ZnO Impregnated with Merbromin Dye: A Mechanistic Investigation.

Fe(III)/TiO₂-Montmorillonite Photocatalyst in Photo-Fenton-Like Degradation of Methylene Blue.

Unit V

TiO₂ nanoparticles immobilized on carbon nanotubes for enhanced visible-light photo-induced activity.

Preparation of a Titania/X-Zeolite/Porous Glass Composite Photocatalyst Using Hydrothermal and Drop Coating Processes.

References

1. Chem. Communi., 2004, 1443-1459
2. J. Mater. Chem., **2011**, 21, 2407–2416 | 2407
3. Egyptian Journal of Petroleum (**2014**) 23, 419–426
4. Journal of Chemical Engineering and Materials Science, Vol. 4(7), pp. 87-92, November **2013**
5. Inorganic Chemistry, Vol. 48, No. 5, **2009 1819-1825**
6. ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH · AUGUST **2015**, DOI 10.1007/s11356-015-5223-y
7. Iran. J. Chem. Chem. Eng, Vol. 33, No. 2, **2014**
8. International Journal of Chemical Engineering, Volume **2015**, Article ID 485463,
9. J. Mater. Res. Technol. **2015**;4(2):126–132
10. Molecules **2015**, 20, 2349-2363; doi:10.3390/molecules20022349

B.Sc.,
COMPUTER SCIENCE

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

SYLLABUS

FROM THE ACADEMIC YEAR
2023 - 2024

TAMILNADU STATE COUNCIL FOR HIGHER
EDUCATION, CHENNAI – 600 005

1. Introduction

B.Sc. Computer Science

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific

challenges. Computer Science is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Programme Outcome, Programme Specific Outcome and Course Outcome

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The

Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

2. Programme Outcomes (PO) of B.Sc. degree programme in Computer Science

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.

- To recognize patterns and to identify essential and relevant aspects of problems.
- Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent society.

The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

PO1: Knowledge

PO2: Problem Analysis

PO3: Design / Development of Solutions

PO4: Conduct investigations of complex problems

PO5: Modern tool usage

PO6: Applying to society

3. Programme Specific Outcomes of B.Sc. Degree Programme in Computer Science

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and real time application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids: (put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

4. Highlights of the Revamped Curriculum

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Computer Science based problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest – Statistics with R Programming, Data Science, Machine learning. Internet of Things and Artificial Intelligence etc..

5. Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	<p>Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical concepts to real world.</p>	<ul style="list-style-type: none"> • Instil confidence among students • Create interest for the subject
I, II, III, IV	<p>Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial)</p>	<ul style="list-style-type: none"> • Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable • Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects • Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc. • Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment • Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools
III, IV, V & VI	<p>Elective papers- An open choice of topics categorized under Generic and Discipline Centric</p>	<ul style="list-style-type: none"> • Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education / industry /

		communication network / health sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors
IV	Industrial Statistics	<ul style="list-style-type: none"> • Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
II year Vacation activity	Internship / Industrial Training	<ul style="list-style-type: none"> • Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
V Semester	Project with Viva – voce	<ul style="list-style-type: none"> • Self-learning is enhanced • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	<ul style="list-style-type: none"> • Curriculum design accommodates all category of learners; ‘Mathematics for Advanced Explain’ component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers; • ‘Training for Competitive Examinations’ –caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: For Advanced Learners / Honors degree		<ul style="list-style-type: none"> • To cater to the needs of peer learners / research aspirants

B.Sc. Computer Science Curriculum Design

First Year

Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	6
Part-III	CC1 - Python Programming	5	5
	CC2 - Practical :i) Python Programming ii) Office Automation	3 2	3 2
	Elective Course 1 (Generic / Discipline Specific) – Discrete Mathematics	3	4
Part-IV	Skill Enhancement Course- SEC-1 Office Automation	2	2
	Foundation Course FC - Problem Solving Techniques	2	2
		23	30

Semester-II

Part	List of Courses	Credit	Hours per week(L/T/P)
Part-I	Language -Tamil	3	6
Part-II	English	3	6
Part-III	CC3 - Data Structure and Algorithms	5	5
	CC4 - Practical:i) Data Structure and Algorithms ii) Web Design	3 2	3 2
	Elective Course 2 (Generic / Discipline Specific) – Digital Logic Fundamentals	3	4
Part-IV	Skill Enhancement Course- SEC-2 Introduction To HTML	2	2
	Skill Enhancement Course – SEC-3 (Discipline Specific / Generic) Understanding Internet	2	2
		23	30

CourseCode-Elective Course	Discrete Mathematics		Credits 3
LectureHours:(L) perweek - 4	TutorialHours:75 (T)perweek	Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory: Elective	Year&Semester:I Year I Semester	AdmissionYear:	
Pre-requisite	Basic Knowledge of Programming concept		
<p>Course Outcomes:(for students: To know what they are going to learn)</p> <p>CO1:Know how to solve various problems on discrete mathematics</p> <p>CO2:Use approximation to solve problems</p> <p>CO3:Differentiation and integration concept are applied</p> <p>CO4:Apply , direct methods for solving linear systems</p> <p>CO5:Discrete solution of ordinary problems</p>			
Units	Contents		RequiredHours
I	Set theory-Sets and elements-Specifications of sets-Identity and Cardinality-Set inclusion-Equality of sets-proper sets-Power sets-Universal set-Operations on sets-ordered pairs-Cartesian product of sets		15
II	Relations and functions-Definition-example- Relations on sets- Equivalence relations-Equivalence Class - Functions		15
III	MATHEMATICAL LOGIC Introduction – Statement (Propositions) – Laws of Formal Logic – Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions – Logical Equivalence – Logical Implication – Normal Forms		15

IV	MATRIX ALGEBRA Introduction – Definition of a Matrix - Types of Matrices – Operations on Matrices – Related Matrices – Transpose of a Matrix – Symmetric and Skew-symmetric Matrices – Complex Matrix – Conjugate of a Matrix – Determinant of a Matrix – Typical Square Matrices	15
V	Adjoint and Inverse of a Matrix –Singular and Non-singular Matrices – Adjoint of a Square Matrix – Properties of Adjoint of a Matrix – Properties of Inverse of a Matrix.	15

Text Book:

DISCRETE MATHEMATICS, Swapan Kumar Chakraborty and Bikash Kanti Sarkar, OXFORD University Press.

Reference Books:

1. DISCRETE MATHEMATICS, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited.
2. Discrete Mathematical Structures with Applications to Computer Science by J.P.Tremblay, R.Manohar TMH edition

CourseCode: SEC-1	Office Automation		Credits: 2
LectureHours:(L) perweek: 2	TutorialHours: (T)perweek	Hours: (P)perweek	Total:(L+T+P) perweek: 2
CourseCategory: SEC-1	Year&Semester: I Year I Semester	AdmissionYear:	
Pre-requisite	Basic skills in Computer operations		
LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)			
<ul style="list-style-type: none"> • The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Powerpoint. • The course is highly practice oriented rather than regular classroom teaching. • To acquire knowledge on editor, spreadsheet and presentation software. 			

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
	Digital Logic Fundamentals	Elective course-2	4	-	-	-	3	4	25	75	100
Learning Objectives											
LO1	To understand the concepts of number systems										
LO2	To learn conversions										
LO3	To construct truth tables										
LO4	To learn SOP and POS										
LO5	To understand various simplifications										
UNIT	Contents										No. of Hours
I	<p>Number Systems :Codes and Digital Logic Binary Number System –Binary to Decimal Conversion – Decimal to Binary Conversion –Octal Numbers –Hexadecimal Numbers –The ASCII Code –The Excess- 3 Code –The Gray Code. Digital Logic:The Basic gates NOT, OR , AND –Universal Logic Gates NOR,NAND – AND-OR Invert Gates.</p>										15
II	<p>Combinational Logic: Circuits Boolean Laws and Theorems – Sum of Products Method–Truth Table to Karnaugh Map –Pairs, Quads and Octets –Karnaugh Simplifications –Don't Care Conditions –Product of Sums Method –Product of Sums Simplification.</p>										15
III	<p>Data Processing and Arithmetic circuits :Multiplexers –Demultiplexers –1-of-16-Decoders –BCD- to-Decimal Decoders – Seven-Segment decoders –Encoders –Exclusive-OR gates. Arithmetic Circuits:Binary Addition –Binary Subtraction –Unsigned Binary Numbers –Sign-Magnitude Numbers – 2's Complement Representation –2's Complement Arithmetic.</p>										15

IV	Flip-Flops: RS Flip Flops –Edge Triggered RS Flip Flops -Edge Triggered D Flip Flops -Edge Triggered JK Flip Flops –JK Master Slave Flip Flops	15
V	Registers :Types of Registers –Serial in serial out –serial in parallel out –parallel in serial out –parallel in parallel out–Universal Shift Register.	15
	Total	75

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of various number systems	PO1,PO6
CO2	Understand basic concepts of digital systems	PO2
CO3	Describe the storage structures	PO2,PO4
CO4	Solve problems using SOP and PoS	PO4,PO6
CO5	Apply concepts for simplifications	PO5,PO6

Text Book

Text Book:

Digital Principles and Applications, by Albert Paul Malvino & Donald P. Leach, Seventh Edition, McGraw Hill Education Private Limited

Reference Books:

1. Fundamentals of Digital Circuits, A. Anand Kumar, Second Edition, PHI Learning Private Limited
2. Digital design, M. Morris Mano, Third Edition, Pearson Education

Course code and title : Digital Logic Fundamentals

Mapping with Programme Outcomes:

CO/PO	PSO					% of co's
	1	2	3	4	5	
CO1	3	3	2	2	2	2.5
CO2	3	3	3	3	2	2.7

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc . COMPUTER SCIENCE

(Choice Based Credit System)

(with effect from the academic year 2020-2021 onwards)

Se m	Par t I/ II/ III/ IV/ V	Subject No.	Subject Status	Subject Title	Contact Hrs/ Week	L	T	P	Credits
III	III	15	Core	Java Programming	5	4	1	0	4
	III	16	Core	Digital Design	4	4	0	0	4
	III	17	Major Practical - III	Java Programming Lab	6	0	0	6	2
	III	18	Allied -III	Scripting Languages	4	4	0	0	3
	III	19	Allied Practical - II	Scripting Languages Lab	4	0	0	4	2
	III	20	Skill Based Core-I	Introduction to Big Data analytics	5	5	0	0	4
	IV	21	Non-Major Elective	1. Fundamentals of Internet and Emerging Technologies 2. Basic Programming Design	2	2	0	0	2
			Common	Yoga*	2	2	0	0	2
			Subtotal (excluding Yoga)		30	19	1	10	21
IV	III	22	Core	Data Structures	5	4	1	0	4
	III	23	Core	Computer Architecture	5	5	0	0	4
	III	24	Major Practical - IV	Data Structure lab	5	0	0	5	2
	III	25	Allied -IV	Machine Learning	4	4	0	0	3
	IV	26	Allied Practicals	PYTHON	4	4	0	0	2

	III	27	Skill Based – Core II	Multimedia Applications	5	5	0	0	4
	IV	28	Non-Major Elective	1. HTML 2. Programming in C	2	2	0	0	2
			Common	Computers for Digital Era *	2	2	0	0	2
	V		Extension Activity	NCC, NSS, YRC, YWF	0	0	0	0	1
	Subtotal (Excluding Computer for Digital Era)				30	24	1	5	23
V	III	29	Core	Relational Database Management System	4	4	0	0	4
	III	30	Core	Data Communication and Computer Networks	5	5	0	0	4
	III	31	Core	PHP and mySQL	5	4	1	0	4
	III	32	Major Practical - V	PHP and mySQL Lab	4	0	0	4	2
	III	33	Major Practical - VI	Machine learning practicals	5	0	0	5	2
	III	34	Major Elective – I (Anyone)	1. Mobile application Development 2. Introduction to Security in Computing 3. Cloud Computing	5	5	0	0	4
	III	35	Skill Based Common	Personality Development/ Effective Communication/ Youth Development	2	2	0	*	2
	Subtotal				30	20	1	9	22
VI	III	36	Core	Operating System	5	5	0	0	4
	III	37	Core	Software Engineering and Testing	4	4	0	0	4
	III	38	Core	Computer Graphics and Visualization	5	4	1	0	4
	III	39	Core	Introduction to Digital Image Processing	4	4	0	0	4

	III	40	Major Practical - VII	Computer Graphics Lab	4	0	0	4	2
	III	42	Major Elective - II	1. Internet of Things(IoT) 2. Information Technology Service Management (ITSM) 3. Neural Networks	4	4	0	0	4
	III	41	Project	Digital Image Processing using SciLab/MathLab	4	0	0	4	4
Subtotal					30	21	1	8	26
Total credits(including Yoga & Computers for Digital Era)									141

➤ L-Lecture T-Tutorial P-Practical

Distribution of marks between External and Internal Assessment is

For Theory 75 : 25

For Practical 50 : 50

Internal Marks for Practical shall be allotted in the following manner

Continuous Assessment: 25 marks “N” number of practical’s being conducted based on the practical prescribed in the syllabus and the marks should be distributed equally for each practical.

Test: 25 marks Two tests should be conducted and average of tests be taken.

Calculation of marks: Sum of marks awarded to number of practicals + the average marks of two tests

Total-50 marks

1. FUNDAMENTALS OF INTERNET AND EMERGING TECHNOLOGIES

Course Objective:

1. To introduce the background, drivers and history in the invention of computers so that the student gains a big picture of the subject.
2. To provide a high level understanding various branches of Computer Science so that students can detect their interest and specialization
3. To introduce the computational models such as cloud computing and make students choose one for their use
4. Understand the Artificial Intelligence technologies, Networks and Cybersecurity and its impact on human life in future
5. Introduce Computer Ethics and help the society retain human values while technology is developing.

Unit I

Man and Machines - Human Capability of five senses to see, hear, smell, speak and act - Basic Structure of a Computer - Data - Characteristics of a Computer-History of Computers - - Classification of Computers (6L)

Unit II

Application Software and Programming Languages - Application Software - Packaged Software Products (Off-the-Shelf Products) - Office Automation - Core Banking System - Enterprise Software Products – SAP - Sales Force – Oracle - CRM and ERP - Early High Level Programming Languages - Translators (Compilers and Interpreters) – FORTRAN – BASIC – COBOL – PASCAL - C Language - Web Programming Languages – HTML - Java Script - Objected Oriented Programming with C++ - C++ Language - C# Language - Java Programming - Modern Programming Language – Python - GO Language - Swift Language - Kotlin Language - R Language - Artificial Intelligence Languages - Database Management Software (6L)

Unit III

Digital Transformation - Data (High Value Commodity) - Digital Transformation in Business - Features of Digital Transformation - Banking and Financial Services Industry (BFSI) - Human Resource Management – Healthcare - Big Data Analytics in Healthcare - Virtual Reality Wearable medical devices - Retail Industry and CPG -Computer Networks - Basic Networking Terminologies - Node / Host - Client / Server - MAC Address - IP Address - Unicast, Multicast and Broadcast - Half Duplex and Full Duplex – Encapsulation - Network Protocols - Open System Interconnection (OSI) Model - TCP/IP Protocol Suite - Transfer Control Protocol (TCP) - User Datagram Protocol (UDP) – Ethernet - Hardware Used for Networking - Hubs and Switches – Routers - Networking Cables - Coaxial Cable - Twisted Pair Cable - Fiber Optics Cable - Network Topology - Ring Topology - Star Topology (Hub and Spoke Topology) - Bus Topology - More Topologies - Wireless Networks - Radio Waves - Micro Waves – Bluetooth – WiFi - Types of Networks - Personal Area Network (PAN) - Local Area Network (LAN) - MAN and WAN (6L)

Unit IV

Cyber Security - IT Assets - Risk and Vulnerabilities - Computer Security Types - Fundamental Principles of Security - Physical Safety and Security - Access Control - Biometric Access Control - Network Security - AAA Server – Firewall – Malware – Spyware – Adware – Spamware – Virus – Ransomware – Worms - Trojan Horse - Computer Virus - Types of Computer Viruses - Antivirus Protection - Digital Signature - Cyber Crime – Hacking – Phishing - Spam e-mails - Attack using Malware - ATM Skimming – Ransomware - Fake News - Deep fake – Cyberbullying - Cyber Law (IT Law) -Cloud Computing and Virtualization - Own Versus Hire - Benefits and Challenges of Cloud Computing – Virtualization –Hypervisor - Data Center - Hardware Platform Infrastructure - Infrastructure as a Service (IaaS) - Software as a Service (SaaS) - Platform as a Service (PaaS) - Application as a Service (AaaS) - Functions as a Service (FaaS) - Cloud Deployment Models - Private Cloud - Community Cloud - Public Cloud - Hybrid Cloud (6L)

Unit V

Artificial Intelligence - Machine Learning - Training Data - Machine Learning Models - Deep Learning and Neural Networks - Robotics Process Automation (RPA) - Speech Recognition - Natural Language Processing – Bots - Natural Language Generation - Computer Vision – Biometrics - Sentiment Analysis - Artificial Intelligence Applications - Banking and Financial Fraud Detection - Medical Diagnostics - Retail Business - Autonomous Car / Driverless Car
Professional Ethics in Computer - Ethics and Law - Ethical Behaviors - Professional Ethics Frameworks

- Utilitarian Ethics - Deontological Ethics - Virtue Ethics, Communitarian Ethics - Ethical Issue in Computer Science - Intellectual Property Rights (IPR) - Data Protection Law - Information Security and Privacy - Software License - Open-Source Software - Freeware - Unethical Content Filtering - Technology Impact on Society (6L)

Textbook

Fundamentals of Internet and Emerging Technologies (2021), C. Xavier, New Age International Publishers Ltd., New Delhi., Chapters 1, 2, 3 and 9 to 16 only.

Reference Book

1. Introduction to Computer Science, Second Edition, ITL Education Solutions Ltd, Pearson Education
2. Introduction to Computers, Peter Norton, 7th Edition, McGraw Hill Education
3. Fundamentals of Computers, V.Rajaram, 5th Edition, PHI

2. BASIC PROGRAMMING DESIGN

Objectives

- Understand the basic design in programming
- Know the various techniques in program design

Unit-I

Computer Program: Introduction – Developing a program – Algorithm – Flowchart – Decision Tables.(6L)

Unit-II

Program Testing and Debugging – Program Documentation – Program Paradigms: Unstructured programming, Structured programming and Object Oriented Programming – Characteristics of a Good Programming. (6L)

Unit-III

Computer Languages: Evolution Programming Languages – Classification of Programming Languages – Generation of Programming Languages – Features of Good Programming language. (6L)

Unit-IV

Computer Software: Software Definition – Relationship between Software and Hardware - Software Categories : System Software and Application Software – Terminology Software Firmware, Liveware, Freeware, Public Domain Software, Shareware, Commercial Software and Proprietary Software. (6L)

Unit V

Evolution of Internet - Internet Basics: Basic Internet Terms – Getting connected to Internet -Internet Applications – E-mail – Searching the Web – Internet and Viruses. (6L)

Text Book:

Introduction to Computer Science, IITL Education Solutions Limited, 2/e, Pearson

Reference Books:

1. Fundamentals of Computers, V.Rajaram, 5th Edition, PHI
2. Introduction to Computers, Peter Norton, 7/e, TMH.

1. HTML

Objectives:

To study the basic concepts of Web design using HTML.

To learn the various tags used in HTML

To make use of Dynamic HTML

Unit I:

Introduction to HTML: Designing a Home page – History of HTML – HTML generations-HTML Documents-Anchor tag –Hyper links –Sample HTML documents.(6L)

Unit II :

Head and Body section: Header Section –Title-Prologue-Links-Colorful web page –Comments lines Designing the body: Heading printing –Aligning the headings-Horizontal rule- paragraph-Tab settings-Image and pictures-Embedding PNG format Images(6L)

Unit III:

Ordered and unordered lists: List-Unordered lists- headings in a list – ordered lists- Nested lists. Table handling: Tables- table creation in HTML- Width of the Tables and cells-Cells spanning multiple rows/Columns- Coloring cells – Column specification(6L)

Unit IV:

Frames: Frame set - Definition – Frame definition –Nested Frames Web Page Design Project : Frameset Definition – Animals – Birds – Fish Forms: Action attributes –Method attributes –Enctype attribute – Drop down list- sample forms(6L)

Unit V:

DHTML and Style sheets: Defining styles –Elements of styles- Linking a style sheet to an HTML document –Inline styles –Internal & External style sheets –Multiple styles(6L)

Text Book:

World Wide Web Design with HTML, C. Xavier, TMH, 2001

Reference Book:

Internet & World Wide Web, H.M.Deital, P.J.Deital & A.B.Goldberg, Pearson Education

Fundamentals of information technology, Mathew's lenon and Alxis leon, Vijay Nicole privatelimited, Chennai.

2..PROGRAMMING IN C

Objectives:

To obtain knowledge about the structure of the programming language C and to develop the program writing and logical thinking skill.

UNIT I

C Declarations –Introduction-Character Set-C tokens-Keywords and Identifiers- Constants-Variables- Data types- Declaration of Variables- Initializing Variables- Dynamic Initialization- Type Modifiers- Type Conversion- Constant And Volatile Variables

Operators and Expressions:- Introduction – Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operator – Bitwise Operators – Special Operators – Arithmetic Expressions – Evaluation of Expressions – Operator Precedence.(6L)

Unit II

Input and Output in C: Introduction – Formatted Functions – Flags, widths and Precision with Format String – Unformatted Functions – Commonly used Library functions. **Decision Statements :** Introduction – Simple IF statement – The IF...Else Statement – Nesting of IF...Else Statements – The ELSE IF ladder – The Break Statement – The Continue Statement – The Goto Statement – The Switch Statement.(6L)

Unit III

Loop Control:- Introduction –The WHILE Statement – The DO Statement – The FOR statement – Nested FOR Loops. **Arrays :-** Introduction – One-dimensional arrays

Declaration of One-dimensional arrays – Initialization of One-dimensional arrays –Array terminology -Two-dimensional arrays – Initialization of Two-dimensional arrays.(6L)

Unit IV

Strings and Standard functions:- Introduction – Declaring and Initializing String Variables – Display of strings in different formats – String Standard functions – String Conversion Functions.(6L)

Unit V

Functions:- Introduction – Basics of a function - Function definition – The Return statement Types of functions – Call by Value and Reference – Function as an argument – Function with operators – function and decision statements – function and loop statements – functions with arrays.(6L)

Text Book:

Programming in ANSI C – 8th Edition by E Balagurusamy – McGraw Hill Publishing Company Limited.

Reference Book:

Programming in C – 3th Edition by Ashok Kamthane – Pearson Education

Computer Basics and C Programming by V. Rajaraman – PHI Learning Private Limited

Programming with C, Third Edition, Byron S Gottfried, McGraw Hill Education Private Limited.

3. Douglas R Simson “Cryptography – Theory and practice”, CRC Press, First Edition, 1995.

3.CLOUD COMPUTING

Objective:

To know in detail about the various Cloud Computing concepts

UNIT I:

Introduction to cloud computing- History of cloud computing. Fundamentals of the cloud computing ecosystem. Cloud computing characteristics. Technical characteristics of cloud computing Basic characteristics of cloud computing- Advantages and disadvantages of cloud computing. Comparison of traditional and cloud computing paradigms. Cluster computing- Grid computing.. Cloud computing- Evaluating the cloud's business impact and economics Business drivers of cloud computing adoption. Future of the cloud (FoC).

Cloud Services and Deployment Models. Objectives. Cloud deployment models. Public (external) cloud. Private/Internal/Corporate cloud. Hybrid cloud. Cloud Service Models- Infrastructure-as-a-Service (IaaS) Platform-as-a-Service (PaaS). Software as a-Service (SaaS) Cloud infrastructure mechanisms Logical network perimeter (LNP) Virtual server. Cloud storage devices (CSD) Cloud usage monitor -Resource replication. Ready-made environment. Cloud service management.(12L)

UNIT II:

Cloud Computing Architecture.. Objectives. Cloud computing architecture design principles.. Cloud computing life cycle (CCLC). Phase 1- Architect. Phase 2- Engage Phase 3- Operate.. Phase 4- Refresh .Cloud computing reference architecture Load balancing approach Mobile cloud computing (MCC). Mobile computing features.. Challenges.. Mobile cloud computing architecture.

Virtualization Technology. Objectives. Understanding virtualization Adopting virtualization. Techniques of virtualization. How virtualization works? XEN- Kernel-based virtual machine (KVM). VMware. Virtual Box –Citrix.Types of Virtualization Data virtualization-Desktop virtualization -CPU virtualization Network virtualization. Storage virtualization -Server virtualization. Virtualization in Cloud(12L)

UNIT III:

Service oriented Architecture Objectives SOA foundation.. Web Services and SOA .SOA communication. SOA components. SOA Infrastructure. Need of SOA. Business Process Management (BPM).Business Process Management Platform as a Service - BPM PaaS Business Process as a Service-BPaaS.

Cloud Security and Privacy... Objectives. Cloud security - Cloud CIA security model.. Data confidentiality Data integrity.. Data availability., Cloud computing security architecture Service provider security issues. Security issues in virtualization. Cloud legal issues . Performance monitoring and management of cloud services Legal issues in cloud computing Data security in cloud .The cloud risk management framework. Risk management process for cloud consumers- Requirement for risk management in ISO/IEC 27001- Data privacy risks in the cloud. Availability risks. Service provisioning risks . **(12L)**

UNIT IV:

Business continuity and disaster recovery Disaster recovery requirements... Mechanisms for cloud disaster recovery. Disaster recovery as a service. The cloud disaster recovery architecture. Challenges of the cloud disaster recovery. Threats in cloud. Security techniques for threats protection. Cloud service level agreements (SLA) practices Components of a cloud SLA. Types of SLAS. Cloud vendors. Issues of Quality of Cloud Services. Techniques for providing QoS to the cloud applications. Migration of a local server into cloud.. Preliminary checklist/planning for migration. Migration steps. Types of migration for cloud-enabled applications.. Trust management. Trust management evaluation attributes. Cloud trust management techniques

Cloud Computing Applications.. Objectives. Introducing cloud computing applications Google App Engine. Google Apps. Gmail. Google Docs.. Google Calendar Google Drive. Google Cloud Data store. Drop box Cloud. Apple iCloud Microsoft Windows Azure Cloud. Amazon Web Services (AWS) Amazon Elastic Compute Cloud (Amazon EC2) Amazon Simple Storage Service (S3). **(12L)**

UNIT V:

Cloud Computing Technologies, Platforms and Services. Objectives. High-performance computing with cloud technologies. Message Passing Interface (MPI).. Map Reduce programming model. Dryad and DryadLINQ.. Eucalyptus cloud platform. Components of Eucalyptus OpenNebula cloud platform. Layers of OpenNebula Features of OpenNebula. OpenStack cloud platform.. OpenStack components Benefits of Open Stack.. Nimbus Cloud Computing Platform Features of Nimbus. The Apache Hadoop ecosystem

Architecture of Hadoop Major components of Hadoop. Hadoop and cloud..

Adoption of Cloud Computing. Objectives. Adoption of cloud computing in the current era Factors affecting cloud computing adoption. Technological factors. Organizational factors Environmental factors.. Cloud computing existing areas of application.. Cloud computing in education. Cloud computing in healthcare. Cloud computing in politics. Cloud computing in business. Cloud computing in agriculture. Case studies Cloud computing adoption in Sub-Saharan Africa. Cloud computing adoption in India. Cloud computing certifications Google Cloud Certifications.. IBM Cloud Certifications.. Amazon Web Services (AWS) Cloud Certifications.(12L)

Text Book:

Cloud Computing, Kamal Kant Hiran,Ruchi Dosai, Temitayo Fagbola,Mehul Mahrishi, BPB publication, First edition 2019.

Reference Book:

1. Cloud Computing, V. K. Pachghare, PHI Learning Pvt Ltd, 2016
2. 2 Cloud Computing, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, TMH, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley Publishing, Inc.

DIGITAL IMAGE PROCESSING USING SCILAB / MatLab

L T P C

4 0 0 4

Objective:

- To get knowledge about the basic programs on Digital Image Processing
- 1) Perform 2D Linear Convolution, Circular Convolution between two 2D matrices.
- 2) Perform Discrete Fourier Transform(DFT), Discrete Cosine Transform(DCT) of 4x4 gray scale image.
- 3) Perform Brightness enhancement, Contrast Manipulation, Image negative of an image.
- 4) Perform threshold operation on an image.
- 5) Perform Edge detection using different edge detectors.
- 6) Perform Dilation and Erosion operation.
- 7) Perform Opening and closing operations
- 8) Read a colour image and separate the image into red, blue and green planes.

Reference:

- 1) Scilab Textbook Companion for Digital Image Processing, S. Jayaraman, S. Esakkirajan And T. Veerakumar, 2016 (https://scilab.in/textbook_companion/generate_book/125)

MSU/ 2020-21 / UG-Colleges /Part-III (B.Sc. Computer Science) / Semester – VI /Major Elective - II

1. INTERNET OF THINGS

L T P C

4 0 0 4

Objective:

- To give a brief idea about IOT working
- To make the students understand the Architecture of IOT

UNIT I:

Fundamentals of Internet of Things: Introduction – Characteristics of IoT – The Physical Design of IoT – IoT Architecture and Components – Logical design of IoT – Communication Models – IoT Communication API – IoT Architecture and Protocols – Introduction – Fog based Architecture of IoT – Near Field Communication – Wireless Sensor Networks – IoT Network protocol stack – IoT technology stack – Blue tooth – Zig Bee – and 6LowPAN.(12L)

UNIT II:

Programming Framework for IoT: Interoperability – Programming Paradigm – Assembly – Introduction to Arduino Programming – Introduction to Python Programming – Introduction to Raspberry Pi . Virtualization: Introduction – Types – Virtualization and IoT – Embedded Virtualization.(12L)

UNIT III:

IoT Application Area: Introduction – Homes – Health care – Agriculture – Military applications – Politics – Constructions – Other application areas . Cloud and IoT : Introduction – Cloud – IoT – Difference between cloud and IoT – Cloud IoT architecture –challenges.(12L)

UNIT IV:

Smart City using IoT: Introduction – Concept – The emergence – Dimensions and Components – Design strategies – Factors affecting automation – IoT applications in smart cities – Education – E-governance – Industry . IoT Use Cases: Industrial IoT Use Case – IoT and smart energy – Smart transportation – Smart health – Smart home – Smart Education system – Governance use case – Smart cities.(12L)

UNIT V:

Network Security for IoT and M2M communications: Introduction – Network Technologies for IoT and M2M – Security for IoT and M2M Technologies – Securities in IETF M2M network Technologies – Security in ETSI M2M Network Technologies – Other M2M standard Efforts.(12L)

Text Books:

1. Internet of Things – Principles, Paradigms and Applications of IoT by Dr.Kamlesh Lakhwani, Dr.Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran (BPB publication First Edition 2020)
2. Internet of Things(IoT) Systems and Applications By Jamil Y . Khan & Mehmet R.Yuce Jenny

Stanford Publishing.

Reference Book

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014

M.Sc. (Computer Science)

Curriculum and Syllabus

for the

AFFILIATED COLLEGES

of



MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12

**Learning Outcome based Curriculum Framework (LOCF)
based on TANSCHC COMMON Curriculum Framework**

With effect from 2023-2024 onwards

VISION AND MISSION OF THE UNIVERSITY

Vision

“To provide quality education to reach the un-reached”

Mission

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled

M.Sc. COMPUTER SCIENCE PROGRAMME

Preamble

The M.Sc. Computer Science Programme is introduced to develop Post Graduates in **Computer Science** with a deep knowledge in theoretical Computer Science who can be employed in research and development units of industries and academic institutions and could pursue higher studies.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To prepare the students to understand the core concepts in **Computer Science**
2. Enable students to develop problem solving and programming skills in the recent technologies there by developing strong employability
3. Empower students to prepare themselves to engage in active research
4. Enable students to pursue competitive exams at National and state level such as NET/SLET/GATE

Name of the Programme	M.Sc., Computer Science
Programme Code	
Duration	PG - Two Years
Programme Outcomes (POs)	<p>Programme Outcomes (POs) for M. Sc Computer Science are as follows</p> <p>At the end of the course, Students will be able to perform the following</p> <p>PO1: Computational Knowledge Understand the basic foundations of Computer Science, Computing Fundamentals with Basic Mathematics.</p> <p>PO2: Problem Analysis Analyze and identify the customer requirements in multidisciplinary domains, create high level design and implement robust software applications using latest technological skills.</p> <p>PO3: Design and Development Design and develop solutions for complex problems in various domains. Serve as the Programmers or the Software Engineers with the sound knowledge of practical and theoretical concepts for developing software.</p> <p>PO4: Research Activity Understand the fundamentals of research and Inculcate the ability to undertake original research at the cutting edge of computer science & its related areas. Produce researchers who can investigate problems in different application domains and creatively develop, and evaluate computational solutions.</p>

	<p>PO5: Software tool usage Adapt and apply modern computing skills and tools to resolve problems with software development tools, software systems, and modern computing platforms.</p> <p>PO6: Professional ethics Understand professional ethics and Cyber regulations and develop systems with social commitments.</p> <p>PO7: Personality development Understand Management Principles and apply the principles to develop software as a team member and manage projects efficiently for multidisciplinary environments.</p> <p>PO8: Communication and Presentation Efficacy Communicate effectively with computing society in both verbal and written form..</p> <p>PO9: Social Responsibility Access Social and Environmental issues for local and global needs and give relevant solutions to them.</p> <p>PO10: Entrepreneurship Identify opportunities for entrepreneurship by creating and adding value for the betterment of an individual and society at large.</p>
<p>Programme Specific Outcomes (PSOs)</p>	<p>PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others’ ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur</p>

	<p>To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development Design and implement HR systems and practices grounded in research that complies with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>
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REGULATIONS of the PROGRAMME

Duration of the Programme: Two years (4 Semesters)

Eligibility:

Students with three year Bachelor's degree in Computer Science / Computer Applications / Information Technology/Software Engg/AI/Data Science/Cyber Security or any other degree accepted by the Syndicate of Manonmaniam Sundaranar University as equivalent in the 10+2+3 pattern

Credit Distribution for PG Programme based on TANSCHÉ Common Curriculum Framework

Semester-I	Credit	Hours	Semester-II	Credit	Hours	Semester-III	Credit	Hours	Semester-IV	Credit	Hours
1.1. Core-I Analysis & Design of Algorithms	4	4	2.1. Core-IV Data Mining And Warehousing	4	4	3.1. Core-VII	4	4	4.1. Core-X	4	4
1.2 Core-II Object Oriented Analysis and Design & C++	4	4	2.2 Core-V Advanced Operating Systems	4	4	3.2 Core-VII	4	4	4.2 Core-XI	4	4
1.3 Core – III Python Programming	4	4	2.3 Core – VI Advanced Java Programming	4	4	3.3 Core – IX	4	4	4.3 Core – XII	4	4
1.4 Elective-I Advanced Software Engineering	3	3	2.4 Elective – III Artificial Intelligence and Machine Learning	3	3	3.4 Elective (Generic / Discipline Centric) – V	3	4	4.4 Elective (Generic / Discipline Centric) – VI	3	4
1.5 Elective-II Advanced Computer Networks	3	3	2.5 Elective-IV Internet of Things	3	3	3.5 Core Industry Module	3	4	4.5 Project with Viva-Voce	3	8
1.6 Core LAB-I Algorithms And OOPS Lab	2	3	2.6 Core LAB-III Data Mining using R Lab	2	4	3.6 Ability Enhancement Course- Soft Skill -3	2	2	4.6 Ability Enhancement Course- Soft Skill -4	2	2
1.7 Core LAB-II Python Programming LAB	2	4	2.7 Core LAB-IV Advanced Java Programming Lab	2	4	3.7 Skill Enhancement Course – Term Paper and Seminar Presentation SEC 3	2	6	4.7 Skill Enhancement Course - Professional Competency Skill	2	2
1.8 Ability Enhancement Course Effective Communication in English	1	2	2.8 Ability Enhancement English for Competitive Exams	1	2	3.8 Internship/ Industrial Activity	2	2	4.8 Extension Activity	1	2
1.9 Skill Enhancement SEC-1 Basics of Web Design	1	2	2.9 Skill Enhancement Course SEC 2 (Web development	1	2						

			using PHP)								
	24	30		24	30		24	30		23	30
				Total Credit Points						95	

Component wise Credit Distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total
Core/Core LAB	16	16	15	12	59
Electives	6	6	3	3	18
(i)Discipline– Centric					
(ii) Skill Enhancement	1	1	2	2	11
(iii)Summer Internship / Industrial Training/ Project			2	3	
Ability Enhancement / Extension	1	1	2	2+1	7
Total Credits	23	23	24	23	95

METHODS OF EVALUATION		
Internal Evaluation	Continuous Internal Assessment Test (15)	25 Marks
	Assignments / Snap Test / Quiz (5)	
	Seminars (3)	
	Attendance and Class Participation (2)	
External Evaluation	End Semester Examination	75 Marks
Total		100 Marks
METHODS OF ASSESSMENT		
Remembering (K1)	<ul style="list-style-type: none"> • The lowest level of questions require student store call information from the course content • Knowledge questions usually require students to identify information in the text book. 	
Understanding (K2)	<ul style="list-style-type: none"> • Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. • The questions go beyond simple recall and require students to combine data together 	
Application (K3)	<ul style="list-style-type: none"> • Students will be able to solve problems by using/applying a concept learned in the classroom. • Students must use their knowledge to determine a exact response. 	
Analyze (K4)	<ul style="list-style-type: none"> • Analyzing the question that asks the students to break down something in to its component parts. • Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations. 	
Evaluate (K5)	<ul style="list-style-type: none"> • Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. • Students are engaged in decision-making and problem-solving. • Evaluation questions do not have single right answers. 	
Create (K6)	<ul style="list-style-type: none"> • The questions of this category challenge students to get engaged in creative and original thinking. • Developing original ideas and problem solving skills 	

PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES (PSO) MAPPING

PROGRAMME SPECIFIC OUTCOMES (PSO)					
	PO1	PO2	PO3	PO4	PO5
PSO1	3	3	3	3	3
PSO2	3	3	3	3	3
PSO3	3	3	3	3	3
PSO4	3	3	3	3	3
PSO5	3	3	3	3	3

Level of Correlation between PO's and PSO's

(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)

Assign the value

1 – Low

2 – Medium

3 – High

0 – No Correlation

Semester I

Course Code	Title of the Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
Core – I	Analysis & Design of Algorithms	4	4		25	75	100
Core – II	Object Oriented Analysis and Design & C++	4	4		25	75	100
Core – III	Python Programming	4	4		25	75	100
Elective – I	Advanced Software Engineering	3	3		25	75	100
Elective – II	Advanced Computer Networks	3	3				
Lab I	Algorithm And OOPS Lab	2		4	40	60	100
Lab II	Python Programming Lab	2		4	40	60	100
Ability Enhancement Course AEC-I	Effective Communication in English	1	2		25	75	100
Skill Enhancement Course– SEC I	Basics of Web Design	1	2		25	75	100
Total		25	22	8			

SECOND SEMESTER							
Type of the Course	Course Name	Credits	Hours Theory	PRACTICAL	IN T	E X T	TOT
Core – IV	Data Mining And Warehousing	4	4		25	75	100
Core – V	Advanced Operating Systems	4	4		25	75	100
Core – VI	Advanced Java Programming	4	4		25	75	100
Elective – III	Artificial Intelligence and Machine Learning	3	3		25	75	100
Elective –IV	Internet of Things	3	3		25	75	100
Lab– III	Data Mining using R - Lab	2		4	40	60	100
Lab – IV	Advanced Java Programming Lab	2		4	40	60	100
Ability Enhancement Course AEC-II	English for Competitive Exams	1	2		25	75	100
Skill Enhancement Course – SEC II	Web Development using PHP	1	2		25	75	100
Total		25	22	8			

LIST OF ELECTIVES

Course code	ADVANCED SOFTWARE ENGINEERING		L	T	P	C
Core/Elective/Supportive	Elective		3			3
Pre-requisite	Basics of Software Engineering & SPM					
Course Objectives:						
The main objectives of this course are to:						
<ol style="list-style-type: none"> 1. Introduce to Software Engineering, Design, Testing and Maintenance. 2. Enable the students to learn the concepts of Software Engineering. 3. Learn about Software Project Management, Software Design & Testing. 						
Expected Course Outcomes:						
On the successful completion of the course ,student will be able to:						
1	Understand about Software Engineering process				K1,K2	
2	Understand about Software project management skills, design and quality management				K2,K3	
3	Analyze on Software Requirements and Specification				K3,K4	
4	Analyze on Software Testing, Maintenance and Software Re-Engineering				K4,K5	
5	Design and conduct various types and levels of software quality for a software project				K5,K6	
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create						
Unit:1	INTRODUCTION				15hours	
Introduction: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.						
Unit:2	SOFTWARE REQUIREMENTS				15hours	
Software Requirements Analysis and Specification : Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.						
Unit:3	PROJECT MANAGEMENT				15hours	

Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead’s software science – Staffing level estimation – Scheduling– Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.										
Unit:4		SOFTWARE DESIGN							15hours	
Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.										
Unit:5		SOFTWARE TESTING							13hours	
Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testingtools-Metrics-ReliabilityEstimation.SoftwareMaintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.										
Unit:6		Contemporary Issues							2 hours	
Expert lectures, online seminars –webinars										
							Total Lecture hours		75 hours	
Text Books										
1	An Integrated Approach to Software Engineering – Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.									
2	Fundamentals of Software Engineering –Rajib Mall, PHI Publication,3rdEdition.									
Reference Books										
1	Software Engineering– K.K. Aggarwal and Yogesh Singh, New Age International Publishers, 3 rd edition.									
2	A Practitioners Approach-Software Engineering,- R.S. Pressman, McGraw Hill.									
3	Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication.									
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]										
1	https://www.javatpoint.com/software-engineering-tutorial									
2	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview									
3	https://onlinecourses.nptel.ac.in/noc19_cs69/preview									
MappingwithProgrammingOutcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

C01	S	S	M	S	S	S	M	M	M	M
C02	S	S	S	S	S	S	S	M	S	S
C03	S	S	S	S	S	S	S	M	S	S
C04	S	S	S	S	S	S	S	M	S	S
C05	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		ADVANCED COMPUTER NETWORKS	L	T	P	C
Core/Elective/Supportive		Elective	3			3
Pre-requisite		Basic Knowledge on mathematics and networking				
Course Objectives:						
The main objectives of this course are to:						
<ol style="list-style-type: none"> 1. Have a detailed knowledge on the concept of networks 2. Know the idea on protocols, OSI layers and its functions. 3. Get knowledge on protocols used in different layers. 4. Know about the function of Internet 						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Understand fundamental underlying principles of computer networking					K1,K2
2	Understand details and functionality of layered network architecture.					K2,K3
3	Apply mathematical foundations to solve computational problems in computer networking					K3,K4
4	Analyze and evaluate performance of various communication protocols.					K4,K5,K6
5	Compare and create new routing algorithms.					K6
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create						
Unit:1	INTRODUCTION					12hours
Introduction- data communications – networks – The internet – Protocols and standards – OSI model – layers in OSI model – TCP/IP protocol suite – addressing – guided media – Unguided media						
Unit:2	DATA LINK LAYER					12hours
Switching – Circuit switched networks – datagram networks – virtual circuit networks – Framing – Flow and error control Multiple access – random access – wired Lan – wireless Lan – Cellular telephony – satellite networks						
Unit:3	NETWORK LAYER					12hours
Network layer – IP V4 addressing – IPV6 addressing – ICMP – IGMP –Network layer delivery – forwarding – unicast and multicast routing protocols						
Unit:4	TRANSPORT LAYER					12hours
Transport layer – Process to process delivery – UDP -TCP -Congestion – congestion control – QOS – Techniques to improve QOS						
Unit:5	APPLICATION LAYER					12hours
Domain name system – name space – domain name space – distribution of name space – DNS in the internet – remote logging - email – file transfer -Network management system – SNMP Protocol						

Unit:6	Contemporary Issues	2 hours
Expert lectures ,online seminars– webinars		
Total Lecture hours		60hours
Text Books		
1	Data communications and networking – Behrouz A Forouzan McGraw Hill 4 th Edition 2015 Reprint	
Reference Books		
1	Computer Networks – Tenenbaum -Pearson -2022	
2	Computer networking –Kurose James F, Ross Keith W -Pearson – 2017	
3	Data and computer communications – William Stallings – Pearson 2017	
4	Computer networks and Internet – Douglas E Comer – Pearson - 2018	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106105080	
2	https://www.tutorialspoint.com/computer-networks/index.asp	
3	https://www.javatpoint.com/computer-network-tutorial	

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	L	M	L
CO2	S	M	M	S	M	M	S	L	M	L
CO3	S	S	M	S	S	M	S	M	M	M
CO4	S	S	S	S	S	M	S	M	M	M
CO5	S	S	S	S	S	S	S	M	M	M

*S-Strong; M-Medium; L-Low

Course code	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING		L	T	P	C
Core/Elective/Supportive	Elective		3			3
Pre-requisite	Basics of AI & An Introduction about ML					
Course Objectives:						
The main objectives of this course are to:						
<ol style="list-style-type: none"> 1. Enable the students to learn the basic functions of AI, Heuristic Search Techniques. 2. Provide knowledge on concepts of Representations and Mappings and Predicate Logic. 3. Introduce Machine Learning with respect Data Mining, Big Data and Cloud. 4. Study about Applications & Impact of ML. 						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Demonstrate AI problems and techniques				K1,K2	
2	Understand machine learning concepts				K2,K3	
3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning				K3,K4	
4	Analyze the impact of machine learning on applications				K4,K5	
5	Analyze and design are all world problem for implementation and understand the dynamic behavior of a system				K5,K6	
K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create						
Unit:1	INTRODUCTION				12hours	
Introduction: AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.						
Unit:2	SEARCHTECHNIQUES				12hours	
Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.						
Unit:3	PREDICATELOGIC				12hours	
Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge- Logic programming -Forward Vs Backward reasoning -Matching-Control knowledge.						
Unit:4	MACHINELEARNING				12hours	

Understanding Machine Learning: What Is Machine Learning? - Defining Big Data - Big Data in Context with Machine Learning - The Importance of the Hybrid Cloud - Leveraging the Power of Machine Learning - The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.

Unit:5	APPLICATIONS OF MACHINE LEARNING	10 hours
Looking Inside Machine Learning: The Impact of Machine Learning on Applications - Data Preparation -The Machine Learning Cycle.		
Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		
Total Lecture hours		60hours

Text Books

1	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
2	George F Luger, "Artificial Intelligence", 4th Edition, Pearson Education Publ, 2002.

Reference Books

1	Machine Learning For Dummies ®, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch.
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Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.ibm.com/downloads/cas/GB8ZMQZ3
2	https://www.javatpoint.com/artificial-intelligence-tutorial
3	https://nptel.ac.in/courses/106/105/106105077/

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		INTERNET OF THINGS	L	T	P	C
Core/Elective/Supportive		Elective	3			3
Pre-requisite		Basics of Sensors & its Applications				
Course Objectives:						
The main objectives of this course are to:						
<ul style="list-style-type: none"> • To get familiar with the evolution of IOT with its design principles. • To outline the functionalities and protocols of internet communication. • To analyze the hardware and software components needed to construct IOT applications. • To identify the appropriate protocol for API construction and writing embedded code. • To realize various business models and ethics in Internet of Things. 						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Understand about IoT, its Architecture and its Applications					K1,K2
2	Comprehend the IoT evolution with its architecture and sensors					K2,K3
3	Assess the embedded technologies and develop prototypes for the IoT products					K4
4	Evaluate the use of Application Programming Interface and design an API for IoT in real-time					K5,K6
5	Design IoT in real time applications using today's internet & wireless Technologies					K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create						
Unit:1	INTRODUCTION				12hours	
Internet of Things: An Overview : IoT Conceptual Framework - IoT Architectural View - Technology Behind IoT - Sources of IoT - M2M Communication - Examples of IoT - Design Principles for Connected Devices : IoT/M2M Systems Layers and Designs Standardization - Communication Technologies - Data Enrichment, Data Consolidation and Device Management at Gateway						
Unit:2	Design Principles for Web Connectivity :				12hours	
Communication Protocols for Connected Devices – Message Communication Protocols for Connected Devices – Web Connectivity for Connected Devices – Network Using Gateway , SOAP, REST, HTTP, RESTful and WebSockets - Internet Connectivity Principles : Internet Connectivity - Internet Based Communication – IP Addressing in the IoT – Media Access Control – Application Layer Protocols: HTTP, HTTPS, FTP, Telnet and Others						
Unit:3	Data Acquiring, Organizing, Processing and Analytics :				12hours	

Data Acquiring and Storage – Organising the Data – Transactions, Business Processes, Integration and Enterprise Systems – Analytics – Knowledge Acquiring, Managing and Storing Processes - Data Collection, Storage and Computing Using a Cloud Platform: Cloud Computing Paradigm for Data Collection, Storage and Computing – Everything as a Service and Cloud Service Models.

Unit:4	SENSORS AND ACTUATORS	10hours
Sensors, Participatory Sensing, RFIDs, and Wireless Sensor Networks : Sensor Technology – Wireless Sensor Networks Technology - Prototyping the Embedded Devices for IoT and M2M : Embedded Computing Basics – Embedded Platforms for Prototyping.		
Unit:5	Prototyping and Designing the Software for IoT Applications	12hours
Prototyping Embedded Device Software - Devices, Gateways, Internet and Web/Cloud Services Software Development – Prototyping online Component APIs and Web APIs – Security for IoT : Vulnerabilities, Security Requirements and Threat Analysis – IoT Security Tomography and Layered Attacker Model – Security Models, Profiles and Protocols for IoT – IoT Application Case Study : Design Layers, Design Complexity and Designing using Cloud PaaS – IoT / IIoT Applications in the premises, Supply – Chain and Customer Monitoring – Connected Car and its Applications and Services.		
Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		
Total Lecture hours		60 hours

Text Book

1	Raj Kamal , “ Internet of Things Architecture and Design Principles”, McGraw Hill, 2017
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Reference Books

1	Ovidiu Vermesan and Peter Friess, “Internet of Things – From Research and Innovation to Mark Deployment” , River Publishers, 2014.
2	Peter Waher, “Learning Internet of Things” ,Packt Publishing, 2015.
3	Donald Norris, “The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black”, Mc Graw Hill, 2015

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2	https://www.javatpoint.com/iot-internet-of-things
3	https://www.tutorialspoint.com/internet_of_things/index.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12

AFFILIATED COLLEGES

MASTER OF SCIENCE in COMPUTER SCIENCE

Learning Outcome based Curriculum Framework (LOCF)

With effect from 2021-2022 onwards

VISION AND MISSION OF THE UNIVERSITY

Vision

“To provide quality education to reach the un-reached”

Mission

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To prepare the students to understand the core concepts in **Computer Science**
2. Enable students to develop problem solving and programming skills in the recent technologies thereby developing strong employability
3. Empower students to prepare themselves to engage in active research
4. Enable students to pursue competitive exams at National and state level such as NET/SLET/GATE

PROGRAM OUTCOMES (POs)

On completion of the M.Sc. (Computer Science) programme, the students will be able to:

- PO1:** Identify and understand the need for basic mathematical and Computational Concepts and apply them to real world problems.
- PO2:** Design and develop applications using computers to analyze and solve computer science related problems.
- PO3:** Design, implement and evaluate a computer-based system, process, component, or programs to meet the stakeholder needs
- PO4:** Analyze, design and choose efficient algorithms and apply them in appropriate Computational solutions
- PO5:** Analyze large data sets in the context of real world problems and interpret results using data analytics.
- PO6:** Understand research methods and apply them to analyze data for decision Making.
- PO7** Realize the importance of lifelong learning and continuous professional development.

Programme Specific Outcomes (PSO)

On Successful completion of the M.Sc. (Computer Science) degree programme, students will be able to:

PSO1: Analyze, design and develop solutions to significant computational problems.

PSO2: Utilize tools and techniques necessary for computing practices.

PSO3: Participate in competitive exams such as SET, NET etc. effectively.

PSO4: Design, develop and evaluate novel projects to meet the desired demands of industry and society.

PSO5: Demonstrate best practices and standards to develop user interactive applications.

PSO6: Work with computing technologies and pursue career in the areas related to Computer Science.

PSO7: Function effectively as an individual or in teams involving multidisciplinary environments.

REGULATIONS of the PROGRAMME

Duration of the Programme: Two years (4 Semesters)

Eligibility:

Students with three year Bachelor's degree in Computer Science / Computer Applications / Information Technology or any other degree accepted by the Syndicate of Manonmaniam Sundaranar University as equivalent in the 10+2+3 pattern

SEMESTER III					
Semester (1)	Course No (2)	Course Type (3)	Course Name (4)	Contact Hrs./ Week (5)	Credits (6)
III	15	Core-14	Digital Image Processing	4	4
	16	Core-15	Soft Computing	4	4
	17	Core-16	Advanced Computer Networks	4	4
	18	Core-17	Research Methodology	4	4
	19	Elective - 2 (Select any one)	1. Cloud Computing 2. Mobile Computing 3. Optimization Technique	4	3
	20	Core - 18 Practical - 5	Digital Image Processing using Sci Lab	4	2
	21	Core –19	Mini Project	6+2*	6
			Subtotal	30	27

Elective - 2 (b) MOBILE COMPUTING

[CLTP 4310]

Course Objectives:

- To learn the fundamental technologies that help in the networking of wireless devices.
- To learn about different wireless technologies
- To learn about the evolution of cellular systems
- To understand the various wireless standards

Course Outcomes:

At the end of the course, the student will be able to

CO1 : Describe what Mobile Computing is and how it works today

CO2 : Recognize the factors that contributed to the emergence of Mobile Computing

CO3 : Able to Understand different mobile application paradigms

CO4 :Apply different protocols for mobile communication

CO5 : Define and identify infrastructure requirement for Mobile Applications

CO6 :Ability to conceptualize new ideas and present them as intellectual property

Course Outline

(Total 45 hours)

UNIT-1

(9 hours)

Introduction: Mobility of bits and bytes–Mobile Device Profiles–Wireless the beginning–Mobile Computing–Dialogue control–Networks–Middle ware and gateways–Applications and services–Developing mobile computing applications. Mobile Computing Architecture: Architecture of Mobile Computing – Three Tire Architecture –Design Consideration for mobile computing – Making existing applications to mobile enabled. Mobile Computing Through Telephony: Multiple Access procedure – Satellite Communication System- Mobile Computing Through Telephone–Developing an IVR Application –Voice XML– Telephony Application Program Interface–Multi Channel and Multi-mode user Interface–Developing Mobile GUI’s – VUI’s

UNIT – II

(9 hours)

Emerging Technologies: Introduction – Bluetooth – Radio Frequency Identification(RFID) – Wireless Broadband(WIMAX)– Mobile IP –Internet Protocol version6(IPV6). Global System for Mobile Communication: Introduction – GSM Architecture and Services– GSM Entities –Call Routing in GSM – PLMN interface – GSM addresses and identifiers – Network Aspects in GSM – Mobility Management – GSM frequency allocation – Personal Communication service – Authentication and Security. Short Message Service: Mobile Computing over SMS - Short Message Service (SMS) – SMS Architecture–Value added Services through SMS– Accessing the SMS bearer.

UNIT – III

(9 hours)

General Packet Radio Service (GPRS): Introduction – GPRS and Packet data Networking –GPRS Network Architecture - GPRS Network Operations – Data Services in GPRS – Applications for GPRS–Limitations of GPRS– Billing and Charging in GPRS– Enhanced Data rate for GSM Evaluation (EDGE).Wireless Application Protocol: Introduction–WAP–MMS –GPRS Applications. CDMA and 3G: Introduction – Spread Spectrum Technology – IS-95 – Wireless Data – Third Generation Networks–Applications of 3G.

UNIT – IV

(9 hours)

Wireless Networks: Wireless Network and Topology-Cellular Telephony-Wireless Transmission and Wireless LAN - Wireless LAN Advantages–IEEE802.11Standards–Wireless LAN Architecture – Mobility in Wireless LAN – Deploying Wireless LAN – Mobile Adhoc Networks and Sensor Networks – MAC Protocol-Routing Protocol-Transport Layer Protocol – QOS - Dynamic Linking and Services-Communication via Web-Wireless LAN security – Wireless Access in Vehicular Environment –Wireless Local Loop– Hiper LAN–WIFI versus 3G. Intelligent Networks and Interworking: Fundamentals of Call Processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – Soft switch – Programmable Networks– Technologies and Interfaces for IN .Client Programming: Mobile Phones–Features of Mobile phones–PDA–Design constraints in Applications for Handheld devices– Recent Developments in Client Technology.

UNIT – V

(9 hours)

Programming for the PALM OS: History of PALM OS–PALM OS architecture–Application Development– Communication in PALM OS– Multimedia. Wireless Devices with Symbian OS: Introduction to Symbian OS- Symbian OS Architecture –Security on Symbian OS. Security Issues in Mobile Computing: Information Security– Web Security-Security Techniques and Algorithms – Security Protocols– Public Key Infrastructure.

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7		Correlation Level L/M/H		PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H		Cognitive Level K ₁ to K ₆
CO1	PO1		M		PSO2	M		K ₁ , K ₂
CO2	PO1	PO2	M	H	PSO2	H		K ₁
CO3	PO3	PO4	M	L	PSO2	M		K ₂
CO4	PO3		H	M	PSO4 PSO2	M	L	K ₂
CO5	PO5		M		PSO4	M		K ₃
CO6	PO6	PO7	M	M	PSO5	M		K ₅

(L – Low, M – Medium, H – High); K₁ – Remember, K₂ – Understand, K₃ – Apply, K₄ – Analyze, K₅–Evaluate, K₆– Create

Text and Reference books

1. AsokeKTalukder, Hasan Ahmed and RoopaRyavagal, "Mobile Computing:Technology, Applications and Service Creation", Second Edition , TMH,2010
2. Jochen Schiller, "Mobile Communications",Second Edition, Pearson Education, 2012
3. T.G. Palanivelu, R. Nakkeeran, Wireless and Mobile Communication, PHI Learning Private Limited, 2009
4. Raj Kamal, "Mobile Computing" ,Second Edition, Oxford University Press, 2012
5. William Stallings, "Wireless Communication and Networks", Pearson Education Asia,2002
6. C.Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks –Architectures and Protocols", 2nd Edition, Pearson Education.2004
7. Ashok K Talukder, Roopa R Yavagal, "Mobile Computing", Tata McGraw-Hill, 2005.
8. JochenBurkhardt, Dr. HorstHenn, Klaus Rintdoff, Thomas Schack, "Pervasive Computing", Pearson, 2009.

S.No	Sem	Subject	Credits	Hours Per Week
1	I	Research and Teaching Methodology	4	4
2		Recent Research Topics in Computing	4	4
3		Elective - I	4	4
4	II	Dissertation	12	
		Total No. of Credits	24	

List of Electives Offered:

1. Internet of Things (IoT)
2. Advanced Digital Image Processing
3. Data Mining and Warehousing
4. Machine Learning Techniques
5. Cloud Computing

PAPER – 1 - INTERNET OF THINGS (IoT)

L T P C
4 0 0 4

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario

UNIT I INTRODUCTION TO IoT

12(10L+2S)

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE

12(10L+2S)

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III IoT PROTOCOLS

12(10L+2S)

Protocol Standardization for IoT - Efforts - M2M and WSN Protocols - SCADA and RFID Protocols - Unified Data Standards - Protocols - IEEE 802.15.4 - BACNet Protocol - Modbus- Zigbee Architecture - Network layer - 6LowPAN - CoAP - Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

12(10L+2S)

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python - IoT Physical Devices & Endpoints - IoT Device -Building blocks - Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS

12(10L+2S)

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT- Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

TOTAL PERIODS: 60

OUTCOMES:

- Upon completion of this course, the students should be able to:
- Analyze various protocols for IoT
- Develop web services to access/control IoT devices.
- Design a portable IoT using Rasperry Pi
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

REFERENCES:

1. Arshdeep Bahga, Vijay Madiseti, –Internet of Things - A hands-on approach, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), –Architecting the Internet of Things, Springer, 2011.
3. Honbo Zhou, –The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
4. Jan Hoeller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, –The Internet of Things - Key applications and Protocols, Wiley, 2012

OBJECTIVES:

- To understand the image fundamentals and mathematical transforms necessary for image. Processing and to study the image enhancement techniques.
- To understand the image segmentation and representation techniques.
- To understand how image are analyzed to extract features of interest.
- To introduce the concepts of image registration and image fusion.
- To analyze the constraints in image processing when dealing with 3D datasets.

UNIT I

12 (10 L+2S)

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Review of morphological image processing

UNIT II

12 (10 L+2S)

SEGMENTATION

Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods-Level set method, Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods

UNIT III

12 (10 L+2S)

FEATURE EXTRACTION

First and second order edge detection operators, Phase congruency, Localized feature extraction-detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features

UNIT IV

12 (10 L+2S)

REGISTRATION AND IMAGE FUSION

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching .Transformation functions-Similarity transformation and Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multiresolution based fusion discrete wavelet transform, Curvelet transform. Region based fusion.

UNIT V

12 (10 L+2S)

3D IMAGE VISUALIZATION

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images.

TOTAL: 60 PERIODS

OUTCOMES:

- To apply image processing techniques in both the spatial and frequency domains.
- To design image analysis techniques in the form of image segmentation and to evaluate the methodologies for segmentation.

TEXT BOOK:

1. John C.Russ, "The Image Processing Handbook", CRC Press,2007.
2. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.
3. Ardeshir Goshtasby, " 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons,2005.
4. H.B.Mitchell, "Image Fusion Theories, Techniques and Applications", Springer,2010.

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Education, Inc., Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson Education, Inc., 2002.
3. Rick S.Blum, Zheng Liu,“ Multisensor image fusion and its Applications“,Taylor& Francis,2006. Faculty of I and C Engg (Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(10)

Objectives:

- This course will introduce the concepts, techniques, design and applications of data warehousing and data mining.
- Learning Outcome and End use:
- Appreciate the strengths and limitations of various data mining and data warehousing models.
- Describe and utilize a range of techniques for designing data warehousing and data mining systems for real-world applications.

Unit I :

12(10L+2S)

DATA MINING: Motivation -Steps in Data Mining - Architecture - Data Mining and Databases - Data Warehouses - Data Mining functionalities - Classification - Data Mining Primitives - Major issues. DATA PREPROCESSING: Descriptive data summarization -Data Cleaning - Data integration and transformation - Data Reduction- Data discretization and concept hierarchy generation.

Unit II:

12(10L+2S)

DATA WAREHOUSE and OLAP TECHNOLOGY: Need for Data Warehouse- multidimensional data model- Data Warehouse architecture - Data Warehousing to Data mining. MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Frequent itemsets, Association rules - Efficient and Scalable frequent itemset mining methods - mining various kinds of Association rules.

Unit III:

12(10L+2S)

CLASSIFICATION AND PREDICTION: Issues regarding classification and prediction - Classification by Decision Tree induction -Bayesian Classification - Rule based classification - Classification using Neural Networks Prediction - Accuracy and error measures - Evaluating the accuracy of classifiers and predictors.

Unit IV:

12(10L+2S)

CLUSTER ANALYSIS: Types of data - Partitioning Methods: k means and k Medoids - Hierarchical Methods: Agglomerative and Divisive hierarchical clustering- Outlier analysis.

Unit V:

12(10L+2S)

MINING TIME SERIES, SEQUENCE DATA: Trend analysis - similarity search - sequence patterns in transactional databases sequential pattern mining: concepts and primitives. MINING TEXT, MULTIMEDIA AND THE WORLD

WIDE WEB: Text data analysis and information retrieval- Dimensionality reduction for text - text mining approaches - similarity search in multimedia data - classification and prediction analysis -mining the web page layout structure - mining multimedia data on the web- web usage minin

TOTAL: 60 PERIODS

OUTCOMES:

- interpret the contribution of data warehousing and data mining to the decision-support level of organizations
- evaluate different models used for OLAP and data preprocessing
- categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis

REFERENCES:

1. HanJiawei, Micheline Kamber and Jian Pei “Data Mining: Concepts and Techniques”, Morgan Kaufmann, 2011.
2. Soman K P, ShyamDiwakar and Ajay V, “Insight into Data Mining Theory and Practice”, PHI Learning, 2009.
3. Arun K Pujari, “Data Mining Techniques”, University Press, 2013.

PAPER – 4 - MACHINE LEARNING TECHNIQUES

L T P C

4 0 0 4

Objectives:

To prepare the students to understand and learn the machine learning techniques and to apply them for the practical problems.

UNIT I

12(10L+2S)

FOUNDATIONS OF LEARNING Components of learning - learning models - geometric models - probabilistic models - logic models - grouping and grading - learning versus design - types of learning - supervised - unsupervised - reinforcement - theory of learning - feasibility of learning - error and noise - training versus testing - theory of generalization - generalization bound - approximation generalization tradeoff - bias and variance - learning curve 3

UNIT II

12(10L+2S)

LINEAR MODELS Linear classification - univariate linear regression - multivariate linear regression - regularized regression - Logistic regression - perceptrons - multilayer neural networks - learning neural networks structures - support vector machines - soft margin SVM - going beyond linearity - generalization and overfitting - regularization - validation

UNIT III

12(10L+2S)

DISTANCE-BASED MODELS Nearest neighbor models - K-means - clustering around medoids - silhouettes - hierarchical clustering - k-d trees - locality sensitive hashing - non-parametric regression - ensemble learning - bagging and random forests - boosting - meta learning

UNIT IV

12(10 L+2S)

TREE AND RULE MODELS Decision trees - learning decision trees - ranking and probability estimation trees - regression trees - clustering trees - learning ordered rule lists - learning unordered rule lists - descriptive rule learning - association rule mining - first-order rule learning

UNIT V

12(10L + 2S)

REINFORCEMENT LEARNING Passive reinforcement learning - direct utility estimation - adaptive dynamic programming - temporal-difference learning - active reinforcement learning - exploration - learning an action utility function - Generalization in reinforcement learning - policy search - applications in game playing - applications in robot control

TOTAL PERIODS: 60

Page **15** of **18**

OUTCOMES:

At the end of the course the students will be able to:

- Describe the various machine learning concepts and models.
- Apply the concepts for the practical problems.
- Compare and analyse the performance of various machine learning algorithms.

REFERENCES:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2012.
2. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
3. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
5. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
7. T. M. Mitchell, "Machine Learning", McGraw Hill, 1997.
8. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009
9. Peter Flach, "Machine Learning", Cambridge University Press, 2015.
10. Shai Shalar-Schwartz & Shai Ben-David, "Understand Machine Learning", Cambridge University, 2015.

Objectives:

To prepare the students to understand and learn the machine learning techniques and to apply them for the practical problems.

Unit I

12(10L+2S)

Distributed System Models and Enabling Technologies: Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency

Computer Clusters for Scalable Parallel Computing: Clustering for Massive Parallelism, Computer Clusters and MPP Architectures, Design Principles of Computer Clusters, Cluster Job and Resource Management

Unit II

12(10L+2S)

Cloud Platform Architecture over Virtualized Data Centers: Cloud Computing and Service Models, Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms GAE, AWS, and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management

Unit III

12(10L+2S)

Service-Oriented Architectures for Distributed Computing: Services and Service-Oriented Architecture, Message-Oriented Middle-ware, Portals and Service Gateways, Discovery, Registries, Metadata and Databases, Work-flow in Service-Oriented Architectures.

Unit IV

12(10L+2S)

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Ubiquitous Clouds and the Internet of Things: Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things, Innovative Applications of the Internet of Things, On-line Social and Professional Networking

TOTAL PERIODS: 60

OUTCOMES:

- Completing this course should provide you with a good understanding of **cloud computing**.
- A systematic knowledge of the fundamental technologies, architecture, and security. ... Identify problems.
- Explain, analyze, and evaluate various **cloud computing** solutions.

REFERENCES:

1. Distributed and Cloud Computing- Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra -Elsevier-2012
2. Cloud Computing - A Hands-on Approach - Arshdeep Bahga, Vijay Madisetti - University Press2014
3. Enterprise Cloud Computing - Gautam Shroff - Cambridge University Press - 2014.

**B.SC.,
ZOOLOGY**

SYLLABUS

**FROM THE ACADEMIC YEAR
2023 – 2024**

B.SC., ZOOLOGY

First Year Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil/ Other Languages	3	6
Part-2	English	3	6
Part-3	1. Core Course 1 : Invertebrata 2. Core Lab Course I: Lab on Invertebrata	5 3	5 3
	Elective I/ Generic/ Discipline Specific . Allied Botany I / Industrial Fish and Fisheries-I Biology of Fish Elective I/: Lab Course- Lab on Allied Botany I/ Industrial Fish and Fisheries I- Lab on Biology of Fish Generic	3 2	4 2
Part-4	Skill Enhancement Course- SEC-1 (Ornamental Fish Farming and Management) Foundation Course (Introduction to Zoology)	2 2	2 2
Total		23	30

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil/ Other Languages	3	6
Part-2	English	3	6
Part-3	Core Course: 3 Chordata 4. Core Lab Course II: Lab on Chordata	5 3	6 3
	Elective I/ Generic/ Discipline Specific: Allied Botany II/ Industrial Fish and Fisheries-II Capture Fisheries Elective I/: Lab Course- Lab on Allied Botany II/ Lab on Industrial Fish and Fisheries II- Capture Fisheries	3 2	4 2

	Generic		
Part-4	Skill Enhancement Course -SEC-2 (Bio Composting for Entrepreneurship)	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) (Animal Behaviour)	2	2
Total		23	30

SEMESTER I

CORE COURSE 1.1 INVERTEBRATA

Course Code CC1	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	INVERTEBRATA	Core	Y	-	-	-	5	5	25	75	100
Learning Objectives											
CO1	To understand the basic concepts of lower animals and observe the structure and functions.										
CO2	To illustrate and examine the systemic and functional morphology of various group of invertebrates.										
CO3	To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity.										
CO4	To compare and distinguish the general and specific characteristics of reproduction in lower animals.										
CO5	To infer and integrate the parasitic and economic importance of invertebrate animals										
UNIT	Details							No. of Hours	Course Objectives		
I	Protozoa: Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up to classes. Type study: <i>Paramecium</i>							12	CO1		

ELECTIVE ALLIED BOTANY-I

Title of the Course	ALLIED BOTANY-I						
Paper Number	Core-Allied-I						
Category	Core	Year	I	Credits	3	Course Code	
		Semester	I				
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total	
	3		1		-	4	
Pre-requisite	To study the basics of botany.						
Learning Objectives							
C1	To study morphological and anatomical adaptations of plants of various habitats.						
C2	To demonstrate techniques of plant tissue culture.						
C3	To familiarize with the structure of DNA, RNA.						
C4	To carryout experiments related with plant physiology.						
C5	To perform biochemistry experiments.						
Course outcomes: CO	On completion of this course, the students will be able to:					Programme outcomes	
CO1	Increase the awareness and appreciation of human friendly algae and their economic importance.					K1	
CO2	Develop an understanding of microbes and fungi and appreciate their adaptive strategies.					K2	
CO3	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.					K3	
CO4	Compare the structure and function of cells and explain the development of cells.					K4	
CO5	Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.					K5	
UNIT	CONTENTS						
I	Algae: General characters of algae - Structure, reproduction and life cycle of the following genera - <i>Anabaena</i> and <i>Sargassum</i> and economic importance of algae.						
II	Fungi, Bacteria and Virus: General characters of fungi, structure, reproduction and life cycle of the following genera - <i>Penicillium</i> and <i>Agaricus</i> and economic importance of fungi. Bacteria - general characters, structure and reproduction of <i>Escherichia coli</i> and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.						

III	<p>Bryophytes, Pteridophytes and Gymnosperms: General characters of Bryophytes, Structure and life cycle of <i>Funaria</i>. General characters of Pteridophytes, Structure and life cycle of <i>Lycopodium</i>. General characters of Gymnosperms, Structure and life cycle of <i>Cycas</i>.</p>
IV	<p>Cell Biology: Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.</p>
V	<p>Genetics and Plant Biotechnology: Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - <i>In vitro</i> culture methods. Plant tissue culture and its application in biotechnology.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Texts	<ol style="list-style-type: none"> 1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut. 2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru. 3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi. 4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi. 5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.
Reference books:	<ol style="list-style-type: none"> 1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi. 2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd. 3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi. 4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet

	Publications, Delhi. 5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi. 6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi. 7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.
Web Resources	1. https://www.kobo.com/us/en/ebook/the-algae-world 2. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html 3. http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm 4. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/ 5. https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf 6. https://www.us.elsevierhealth.com/medicine/cell-biology 7. https://www.us.elsevierhealth.com/medicine/genetics 8. https://www.kobo.com/us/en/ebook/plant-biotechnology-1

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	1	3	3	3	3
CO 4	3	3	2	3	3	3	2	3	2	3
CO 5	3	2	2	2	2	2	2	1	2	1

S-Strong (3) M-Medium (2) L-Low(1)

ELECTIVE ALLIED BOTANY PRACTICALS

Title of the Course	ALLIED BOTANY PRACTICALS						
Paper Number	Core-Allied Practicals-I						
Category	Core	Year	I	Credits		Course Code	
		Semester	I				
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total	
			-		2	2	
Pre-requisite	Practicals pertaining to above subjects is important to get knowledge on various aspects of plants.						
Learning Objectives							
C1	To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.						
C2	To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.						
C3	To be familiar with the basic concepts and principles of plant systematics.						
C4	Understanding of laws of inheritance, genetic basis of loci and alleles.						
C5	To learn about the physiological processes that underlie plant metabolism.						
Course outcomes:	On completion of this course, the students will be able to					Programme Outcomes	
CO1	To study the internal organization of algae and fungi.					K1	
CO2	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.					K2	
CO3	To study the classical taxonomy with reference to different parameters.					K3	
CO4	Understand the fundamental concepts of plant anatomy and embryology.					K4	
CO5	To study the effect of various physical factors on photosynthesis.					K5	
EXPERIMENTS							
<ol style="list-style-type: none"> 1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms. 2. Micro photographs of the cell organelles ultra structure. 3. Simple genetic problems. 							

4. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Cell biology and Biotechnology.	
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	<ol style="list-style-type: none"> 1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi. 2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi. 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi. 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England. 5. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.
Reference Books	<ol style="list-style-type: none"> 1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India. 2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher. 3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing. 4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications. 5. Steward, F.C. 2012. Plant Physiology Academic Press, US
Web sources	<ol style="list-style-type: none"> 1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883 2. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover 3. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ

MSU/2023-24/UG-Colleges/Part-III (Industrial Fish and Fisheries –Elective/ Generic)

SEMESTER I

**(Elective/ Generic Course for I Year B.Sc Zoology Programme
Students from the Year 2023– 2024 onwards)**

ELECTIVE/ GENERIC COURSE 1.1- BIOLOGY OF FISH

L	T	P	C
4	--	--	3

LEARNING OBJECTIVES (LOs)

The objectives the course are enabling the students to

- understand the basic concepts of biology of fishes
- analyse and compare structure and physiology of the fishes
- identify the feeding behaviour and food consumption of the cultured fishes
- apply the knowledge of the various aspects of growth and development of fishes.

COURSE OUTCOMES (COs)

On successful completion of the course the student will be able to

CO1: recognise the basic concept of biological features of fishes

CO2: understand and compare the structure and function of fishes

CO3: apply and synthesize the behaviour and feeding pattern

CO4: evaluate the strategy for rearing practices and marketing

CO5: design suitable breeding methods and scientific approach and understand

the biology, food value, marketing of fishes and fishery products.

UNIT I

Introduction: Fish Biology – Definition and basic concepts of biosystematics. Importance of classification – Theories of biological classification. Variations in structure, Form, Skin, Coloration, Scales, Mouth, Jaws, Teeth, Fins, Spines and other structures used in taxonomic studies. Induced breeding techniques – Hatching methods – Seed and Brood transport.

(12L)

UNIT II

Study of external morphology and internal organization of a typical Elasmobranch and Teleost. Alimentary Canal and Associated Structures – Gills – Swim Bladder – Accessory Respiratory organs – Lateral line system – Sound and Light producing organs. Morphological and anatomical characters of Prawn, Crab, Lobster, Bivalve, Gastropod and Cephalopod (one example each)

(12L)

UNIT III

Natural food of fishes – Feeding habits in various groups of fresh water and marine fishes, Prawns, Crabs, Lobsters and Cephalopods. Qualitative and Quantitative estimation of food consumption based on experimental studies and stomach content analysis – Seasonal changes in food availability and food preference – Food and Feeding in relation to age – Food selectively – Feeding intensity. Nutrition of fishes and utilization of food, Feeding strategies and energies. Artificial feeding – Nutritional requirement.

(12L)

UNIT IV

Growth of fish – Absolute, Relative, Isometric and Allometric growth. The Cube Law – Methods for determination of growth – Length frequency analysis – Analysis of growth checks on hard parts like Scales, Otolith and Vertebrae – Estimation of growth by direct methods – Marking and tagging of fish for growth studies – Aging of fish and shell-fish based on length data and growth checks – Length weight relationships, Ponderal index, Relative condition factor and Gonado – Stomach index.

(12L)

UNIT V

Types of reproduction, Sex differences – Sexual maturity, Classification of maturity stages, Size at first maturity. Estimation of fecundity – Ova diameter frequency – Fecundity in relation to length, Weight, Age and food supply. Spawning habits – Factors affecting Spawning, Spawning seasons and frequency. Embryonic and early development – Types of egg and Larvae – Metamorphosis of larva – Larval life and feeding habits. Reproductive behaviour and parental care – Social behaviour – Aggregation and Shoaling. Migrations – Anadromous and Catadromous. **(12L)**

(TOTAL 60L)

BOOKS FOR REFERENCE

1. The Biology of Fishes, Kyle, H. M., T.F.H. Publication, Hong kong 366 P.
2. The Life of Fishes, Marshall,N.B.1965,Weidenfeld& Nicolson, London 402 P.
3. The Marine and Freshwater Fishes of Ceylon,Munro I.S.R,1982. .Soni Reprints Agency, New Delhi 351 P.
4. Inland Fishes of India and Adjacent Countries., Vol I & Vol II,Talwar, P.K. and A.G.Jhingran,1991,Oxford & IBH Publishing Co.Ltd.,New Delhi 1958 P.
5. Fisheries Ecology, Pitcher, T.J. & P.J.E. Hart,1992,Room Helm,London 414 P.
6. Introduction to the Practice of Fisheries Science.Royce,W.F.1984,Academic Press 438 P.
7. Fisheries Science its methods and application,1993,Rounsfell,G.A. and W.H.Everheart, John William & Sons New York,444

COs at Cognitive level and mapping with POs and PSOs

SEMESTER I																
PART III																
ELECTIVE/ GENERIC COURSE 1: BIOLOGY OF FISH																
CO	COGNITIVE LEVEL	PO							PSO							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	K2- Understand	3	3	3	3	2	-	1	3	2	3	3	3	2	1	1
CO2	K3-Apply	3	3	3	2	1	3	1	3	3	3	3	2	3	3	1
CO3	K4- Analyse	3	3	3	3	3	3	1	3	3	3	2	3	2	3	2
CO4	K5- Evaluate	3	2	2	2	3	2	-	3	3	3	2	3	2	3	1
CO5	K6 -Creativity	2	3	3	2	3	2	-	2	3	3	3	2	3	-	1

Strongly Correlated (3), Moderately Correlated (2), Weakly Correlated (1), No Correlation (0)

**MSU/2023-24/UG-Colleges/Part-III (Industrial Fish and Fisheries –
Elective/ Generic) SEMESTER I – Lab on Elective /Generic Course**

LAB ON ELECTIVE / GENERIC COURSE I- BIOLOGY OF FISH

L	T	P	C
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PRACTICALS

1. Methods for Collection, Handling, Identification and Preservation of fish for taxonomic purposes.
2. Study of external morphology of fish. Specific identification of important fresh water and marine fishes, prawns, crabs, bivalves and cephalopods of India.
3. Identification of scales of fishes – Placoid, Cycloid and Ctenoid scales.
4. Study of food and feeding habits of fishes – Plankton feeder, Herbivore feeder, Carnivore feeder, Omnivore feeder, Detritus feeder. Study of Structural Adaptations for Diet.
5. Qualitative and Quantitative methods for Stomach content analysis.
6. Estimation of Oxygen, Carbon dioxide, Salinity content in water samples.
7. Plankton analysis in the water samples – any two.
8. Identification of Anadromous and Catadromous fishes.

Books for reference

1. The Biology of Fishes, Kyle, H. M., T.F.H. Publication, Hong kong 366 P.
 2. The Life of Fishes, Marshall, N.B. 1965, Weidenfeld & Nicolson, London 402 P.
 3. The Marine and Freshwater Fishes of Ceylon, Munro I.S.R., 1982. Soni Reprints Agency, New Delhi 351 P.
 4. Inland Fishes of India and Adjacent Countries., Vol I & Vol II, Talwar, P.K. and A.G. Jhingran, 1991, Oxford & IBH Publishing Co Pvt Ltd., New Delhi 1958 P.
 5. Fisheries Ecology, Pitcher, T.J. & P.J.E. Hart, 1992, Room Helm, London 414 P.
 6. Introduction to the Practice of Fisheries Science. Royce, W.F. 1984, Academic Press 438 P
- Fisheries Science its methods and application, 1993, Rounsfell, G.A. and W.H. Everheart John William & Sons

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| <ol style="list-style-type: none"> 4. https://medlineplus.gov/genetocs/understanding/basics/cell/ 5. https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf 6. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf 7. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4 |
|--|

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	1	3	3	1	3
CO 4	3	3	2	3	3	3	3	2	3	3
CO 5	3	2	2	2	2	2	2	1	2	2

S-Strong (3)

M-Medium (2)

L-Low(1)

ELECTIVE ALLIED BOTANY-II

Title of the Course	ALLIED BOTANY-II					
Paper Number	Allied-II					
Category	Core	Year	I	Credits	3	CourseCode
		Semester	II			
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total
	3		1		-	4
Pre-requisite	To study basics of botany.					
Learning Objectives						
C1	To be familiar with the basic concepts and principles of plant systematics.					
C2	Learn the importance of plant anatomy in plant production systems.					
C3	Understand the mechanism underlying the shift from vegetative to reproductive phase.					
C4	To learn about the physiological processes that underlie plant metabolism.					
C5	To know the energy production and its utilization in plants.					
Course outcomes : CO	On completion of this course, the students will be able to					Programme Outcomes
CO1	Understand the fundamental concepts of plant anatomy and embryology.					K1
CO2	Analyze and recognize the different organs of plants and secondary growth.					K2
CO3	Understand water relation of plants with respect to various physiological processes					K3
CO4	Classify aerobic and anaerobic respiration.					K4
CO5	Classify plant systematics and recognize the importance of herbarium and virtual herbarium.					K5
UNIT	CONTENTS					
I	MORPHOLOGY OF FLOWERING PLANTS: Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.					
II	TAXONOMY: Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae					
III	ANATOMY Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot					

	and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.
IV	EMBRYOLOGY Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.
V	PLANT PHYSIOLOGY Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	<ol style="list-style-type: none"> 1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies. 2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi. 3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi. 4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont. 5. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.
Reference books	<ol style="list-style-type: none"> 1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad. 2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi. 3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing. 4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd. 5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi. 6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi. 7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New

	Delhi.
Web Resources	<ol style="list-style-type: none"> 1. https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y 2. https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFnuUC&redir_esc=y 3. https://archive.org/EXPERIMENTS/plantanatomy031773mbp 4. https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG 5. https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	1	3	3	3	3
CO 4	3	3	2	3	3	3	3	2	3	2
CO 5	3	2	2	2	2	2	2	1	2	2

S-Strong (3) M-Medium (2) L-Low(1)

ELECTIVE ALLIED BOTANY PRACTICALS

Title of the Course	ALLIED BOTANY PRACTICALS						
Paper Number	Core-Allied Practicals-I						
Category	Core	Year	I	Credits 2		Course Code	
		Semester	II				
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total	
			-		2	2	
Pre-requisite	Practicals pertaining to above subjects is important to get knowledge on various aspects of plants.						
Learning Objectives							
C1	To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.						
C2	To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.						
C3	To be familiar with the basic concepts and principles of plant systematics.						
C4	Understanding of laws of inheritance, genetic basis of loci and alleles.						
C5	To learn about the physiological processes that underlie plant metabolism.						
Course outcomes: CO	On completion of this course, the students will be able to					Programme Outcomes	
CO1	To study the internal organization of algae and fungi.					K1	
CO2	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.					K2	
CO3	To study the classical taxonomy with reference to different parameters.					K3	
CO4	Understand the fundamental concepts of plant anatomy and embryology.					K4	
CO5	To study the effect of various physical factors on photosynthesis.					K5	
EXPERIMENTS.							
<ol style="list-style-type: none"> 1. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family. 2. To dissect a flower, construct floral diagram and write floral formula. 3. Demonstration experiments <ol style="list-style-type: none"> 1. Ganong's Light screen 							

	<p>2. Ganong's respiroscope</p> <p>4.To make suitable micro preparations of anatomy materials prescribed in the syllabus.</p> <p>5.Spotters - Angiosperm anatomy and Embryology</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Texts</p>	<p>1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi. 2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi. 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi. 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England. 5. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.</p>
<p>Reference Books</p>	<p>6. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India. 7. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher. 8. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing. 9. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications. 10. Steward, F.C. 2012. Plant Physiology Academic Press, US</p>
<p>Web sources</p>	<p>8. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883 9. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover 10. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-</p>

	ebook/dp/B07CV96NZJ 11. https://medlineplus.gov/genetocs/understanding/basics/cell/ 12. https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf 13. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf 14. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4
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Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	1	3	3	1	3
CO 4	3	3	2	3	3	3	3	2	3	3
CO 5	3	2	2	2	2	2	2	1	2	2

S-Strong (3)

M-Medium (2)

L-Low(1)

SEMESTER II

ELECTIVE/ GENERIC COURSE II -CAPTURE FISHERIES

L	T	P	C
4	--	--	3

LEARNING OBJECTIVES (LOs)

The objectives are to enable the students to

- understand the basic concepts, types and problems of capture fisheries
- analyse the different techniques of capturing methods
- analyse the different techniques of capturing methods
- identify and compare the cultivable fish species and benefits
- apply the knowledge of fish marketing.

COURSE OUTCOMES (COs):

On successful completion of the course the student will be able to

CO1: recollect the basic concepts of fisheries and recognize and solve the problems in capture fisheries

CO2: understand and adopt suitable/ recent technology for capturing

CO3: apply the knowledge on feeding pattern and design local strategy for management

CO4: evaluate and adopt suitable marketing method and overcome the problems

CO5: emphasize the application of laws and acts of Fisheries welfare

UNIT I

Capture Fisheries – Inland Capture Fisheries – Scope and importance of Capture Fisheries in India and World. Present yield and Estimates of Potential. Inland capture fishery resources of Indian Fisheries of major and minor carps. Cat fishes and other groups. Problems and management.

(12L)

UNIT II

Cold water fishery resources – Fisheries of trout, Mahaseer and other Cold water Species. Lacustrine fisheries – Species, Catch, Fishing gears, Potential and Problems of Development and management. Estuarine fisheries. Fisheries of Brackish water lakes and back waters – Problems and Management.

(12L)

UNIT III

Salient features of cultivable species of fishes and shell fishes. Marine fishery resources of India – Fisheries of Sardine, Lesser Sardine, Anchovies, Other Clupeoids, Mackerel, Ribbon fishes, Tunnies, Carangids and Cephalopods.

(12L)

UNIT IV

Mid water and Demersal fisheries – Fisheries of Elasmobranches, Bombay duck, Cat fishes, Silver Bellies, Sciaenids, Pomfrets, Threadfins, Thread fin brems and Perches, Flatfishes, Prawns lobsters, Crabs, Mussels Oysters and Clams, Culture of edible Oyster.

(12L)

UNIT V

Biological aspects of fishery managements, Principles of Conservation, Development and Management Concept and practice. Population dynamics – Concept of recruitment and yield, problems of over fishing, MSY, MEY and OSY

(12L)

(TOTAL 60L)

Books for reference

1. Fish and Fisheries of India Jhingran V.G. 1982 Hindustan Publishing Corporation India Delhi Rev.Ed.
2. Prawns and Prawn fisheries of India Kurian C.V and V.C Sebastian 1982.Hindustan Publishing corporation (India) Delhi Rev.Ed.
3. Marine Fisheries. Bal D.V and K.V Rao 1990.Narendra Publishing House Delhi Rev.Ed.
4. Cold water fisheries of India. Jhingran V.G and K.L Sehgal 1979. Barrackpore Inland fisheries society of India.

5. Fisheries Development in India.Srivastava U.K and Dharma Reddy 1983.Concept publishing co.,New Delhi.
6. Introduction to the practice of fishery science,Royce 1984 Academic press,London.
7. Fishery Science its methods and Applications,Rounsefell,G.A and W.H Everhart 1953 John.Wiley, New York

COs at Cognitive level and mapping with POs and PSOs

SEMESTER II PART III INDUSTRIAL FISH AND FISHERIES – ELECTIVE/ GENERIC COURSE 2.1 - CAPTURE FISHERIES																
CO	COGNITIVE LEVEL	PO							PSO							
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
CO1	K2- Understand	3	3	3	2	1	-	-	3	3	3	3	3	3	-	-
CO2	K3-Apply	3	3	3	2	1	2	1	3	3	3	3	2	3	3	1
CO3	K4- Analyse	3	3	3	3	3	2	1	3	3	3	2	3	2	3	2
CO4	K5- Evaluate	3	2	3	2	2	2	1	3	3	2	2	3	2	3	1
CO5	K6–Creativity	2	3	3	1	2	1	1	2	3	2	2	3	2	1	-

Strongly Correlated (3), Moderately Correlated (2), Weakly Correlated (1), No Correlation (0)

MSU/2023-24/UG-Colleges/Part-III (Industrial Fish and Fisheries –Elective/ Generic

SEMESTER -II / Lab on Allied/ Generic Course

LAB ON ELECTIVE/ GENERIC COURSE II- CAPTURE FISHERIES

L	T	P	C
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1. Identification of commercial fresh water and marine prawns.
2. Visit to a Prawn farm.
3. Visit to a fish processing industry.
4. Visit to a Landing center.
5. Raceway culture system.

6. Field visit to observe fishing and to collect field data regarding species composition, Craft, Gear and Field problems regarding riverine, estuarine, reservoir and cold water fisheries.
7. Study of fishery development programmes.
8. Study of fishery management problem – Laws, Acts and field problems.

Elective/ Generic Course Practical Examination at the end of each Semester

Common Course Structure for other UG Degree programmers in Science

B.Sc Zoology Major

(with effect from the academic year 2020-2021 onwards)

III	I	Language	Tamil/Other Language	1	6	4	25	75	100	30	40
	II	Language	English	1	6	4	25	75	100	30	40
	III	Core	Developmental Zoology	1	4	4	25	75	100	30	40
	III	Major Practical- III	Developmental Zoology	1	2	1	25	75	100	30	40
	III	II-Allied-I	Cell Biology, Genetics and Biotechnology / Industrial Fish and Fisheries-Biology of Fish	1	4	3	25	75	100	30	40
	III	II-Allied Practical- I	Cell Biology, Genetics and Biotechnology / Industrial Fish and Fisheries-Biology of Fish	1	2	1	50	50	100	20	40
	III	Skill Based-Core	(Any one) 1. Home Aquarium 2. Nutrition and Dietetics	1	4	4	25	75	100	30	40
	IV	Non- Major Elective	(Any one) 1. Bee Keeping 2. Clinical Biology	1	2	2	25	75	100	30	40
	IV	Common	YOGA*		2	2	25	75	100	30	40
			Sub total	8	30	25					
IV	I	Language	Tamil/Other Language	1	6	4	25	75	100	30	40
	II	Language	English	1	6	4	25	75	100	30	40
	III	Core	Cell and Molecular Biology	1	4	4	25	75	100	30	40
	III	Major Practical- IV	Cell and Molecular Biology	1	2	1	50	50	100	20	40
	III	II-Allied-II	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial	1	4	3	25	75	100	30	40

			Fish and Fisheries- Capture Fisheries								
	III	II-Allied Practical- II	Developmental Zoology, Ecology, Animal Physiology and Evolution / Industrial Fish and Fisheries- Capture Fisheries	1	2	1	50	50	100	20	40
	III	Skill Based -Core	(Any one) 1.Biophysics and Bioinstrumentation 2.Vermitechnology	1	4	4	25	75	100	30	40
	IV	Non- Major Elective	(Any one) 1. Public Health and Hygiene 2.Community and Social Preventive Medicine.	1	2	2	25	75	100	30	40
	V	Extension Activity	NCC/NSS/YRC/YW/P E			1	25	75	100	30	40
	IV	Common	Computer for Digital Era*			2	25	75	100	30	40
			Sub total	8	30	26					
V	III	Core	Ecology and Toxicology	1	5	4	25	75	100	30	40
	III	Core	Genetics	1	5	4	25	75	100	30	40
	III	Core	Animal Physiology and Biochemistry	1	5	4	25	75	100	30	40
	III	Core	Immunology and Microbiology	1	5	4	25	75	100	30	40
	III	Major Practical- V	Ecology and Toxicology and Genetics	1	3	4	50	50	100	20	40
	III	Major Practical- VI	Animal Physiology and Biochemistry	1	3		50	50	100	20	40
	III	Major Practical- VII	Immunology and Microbiology	1	2		50	50	100	20	40
	IV	Skill Based Common	Personality Development/ Effective Communication/ Youth	1	2	2	25	75	100	30	40

Common Course Structure for other UG Degree programmers in Science

B.Sc Zoology Major

(with effect from the academic year 2020-2021 onwards)

			Leadership								
			Sub total	8	30	22					
	III	Core	Evolution	1	5	4	25	75	100	30	40
	III	Core	Animal Biotechnology	1	5	4	25	75	100	30	40
	III	Core	Biostatistics, Computer Applications & Bioinformatics	1	5	4	25	75	100	30	40
VI	III	Major Elective	Group A (Any one) 1. Sericulture 2. Economic Entomology 3. Dairy farming	1	5	4	25	75	100	30	40
	III	Major Elective	Group B (Any one) 1. Apiculture 2. Food and Food Processing Technology 3. Poultry Science	1	4	4	25	75	100	30	40
	III	Major Practical- VIII	Evolution and Animal Biotechnology	1	2	4	50	50	100	20	40
	III	Major Practical- IX	Biostatistics, Computer Applications & Bioinformatics	1	2		50	50	100	20	40
	III	Major Elective Practical- X	Corresponding Major Electives	1	2		50	50	100	20	40
			Sub total	8	30	24					

SEMESTER VI

MAJOR ELECTIVE

(Any One)

ELECTIVE PAPER: 6.4A -SERICULTURE

5Hrs/Week

Credits-4

OBJECTIVES:

To explore the scope for students adopting Sericulture as a vocation after their graduation as it is rural based and welfare oriented agro based industry.

OUTCOME:

Students learned how to rear, maintain the silk worm scientifically and know the reeling of silk.

UNIT I

Importance of Sericulture: Sericulture industry in India- Sericulture as cottage industry, role of Central Silk Board, Moriculture: Morphology of Mulberry plant- High yielding varieties – methods of propagation- irrigation. Manuring: Biofertilizers – Green manuring – Triaccontanol for increased mulberry productivity – Seriboost. Pruning- Harvesting and storing of mulberry leaves- Package of practices for mulberry cultivation. (15L)

UNIT II

Diseases of mulberry: Fungal diseases – fungal root diseases, fungal shoot diseases; Bacterial diseases – leaf blight disease, rot disease; Viral diseases – mulberry leaf mosaic disease, dawn disease; Nematode diseases: root knot disease; Deficiency diseases: nitrogen deficiency, phosphorus deficiency, potassium deficiency, magnesium deficiency and calcium deficiency diseases; Pests of mulberry – leaf eating insect pests and borer pests one example each. (15L)

UNIT III

Silkworm: Classification of Mulberry silkworm- habit and habitats; Voltinism- races of silkworms; Life cycle- Structure of egg- larva- pupa and adult- Sexual dimorphism. Digestive system- circulatory system- excretory system- respiratory system, nervous system and reproductive system, endocrine glands - other glands of Silkworm. (15L)

UNIT IV

Rearing of Silkworm: Rearing house – Rearing appliances. Rearing operation: Disinfection – Brushing – Maintenance of optimum conditions, Feeding – Bed cleaning – Spacing. Methods of Rearing; Young age worms – Chawki rearing - Rearing of late age larva-Types; Shelf rearing. Floor rearing, Shoot rearing- Application of Sampoorna. Mounting: Mountages- Methods – Precautions. Cocoon marketing: Characteristics of cocoon – defective cocoons – methods of harvesting. (15L)

UNIT V

Diseases of silkworms; Protozoan diseases – Pebrine; Viral diseases – Flacherie, Gattine, Grasserie; Bacterial diseases – Flacherie, Septicemia, Sotto, Court, Fungal diseases – Muscardine. Pests: Uzy fly, Dermestid beetle of silkworm. Silk reeling: Cocoon stifling – types- storage of stifled cocoons- sorting- cocoon boiling and deflossing – brushing, Process of reeling: Different methods- silk waste and byproducts of silk reeling- Raw silk and marketing.

(15L)

(TOTAL: 75L)

REFERENCE BOOKS:

1. Ganga, G. and I. Sulochana Chetty, An introduction to Sericulture. Oxford & IBH Publishing Company Private Limited, S -155, Panchshila Park, New Delhi.
2. Ganga, G. Comprehensive Sericulture, Volume – 2 Silkworm Rearing and Silk Reeling. Oxford & IBH Publishing Company Private Limited, S -155, Panchshila Park, New Delhi.
3. Dandin, S.B, Jayant Jayaswal and K. Giridhas, Hand Book of Sericultural Technologies, Central Silk Board, Madivala, Bangalore –68.
4. Kamile Afifa. S and Masoodi M. Amin, Principles of Temperate Sericulture, Kalyani Publishers, B – 1/1292, Rajinder Nagar, Ludhians.
Kesary, M and M. Johnson, Sericulture, Department of Zoology, N.M.. Christian College, Marthandam

PRACTICALS:

1. Dissection of silk glands, digestive and nervous systems.
2. Dissection of male and female reproductive system.
3. Selection of mulberry leaves according to different stages.
4. Life history – egg, larva, pupa and adult.
5. Sexual dimorphism in larva, pupa and adult.
6. Mulberry varieties such as MR2, S30, S36, V2.
7. Chandrika.
8. Rearing tray and rearing stand.
9. Raw silk.
10. Report on field visit to Sericulture farm/ unit.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.4B -ECONOMIC ENTOMOLOGY
5Hrs/Week **Credits-4**

OBJECTIVES:

To understand the role of insects in the ecosystem and their beneficial and harmful impacts on the society and plants.

OUTCOME

Students learned about the beneficial and harmful insects.

UNIT I

Structure and salient features

Brief account of external morphology of head, thorax and abdomen; Classification and development (metamorphosis) of insects; Salient features (up to order) and economic important of Thysanura, Orthoptera, Odonata, Thysanoptera, Isoptera, Coleoptera, Lepidoptera, Hemiptera, Diptera, Hymenoptera, Dermaptera

(15L)

UNIT II

Productive insects

Sericulture- Types of Silkworm, Life cycle and rearing of mulberry silkworm, *Bombyxmori*; Economic importance of silkworms

Apiculture – Types of honey bees, Life cycle and culture methods, bee product and its economic importance

Lac culture – Lac insect, *Lacciferlacca*- Life cycle, Lac processing, Lac products and Economic importance.

(15L)

UNIT III

Beneficial insects

Biological control agents – Characters and different between parasitoids and predators (common Indian insects); General characters and beneficial role of scavengers, pollinators, weed killers; Medicinal and Aesthetic value of insects; Insect as human food (general account only)..

(15L)

UNIT IV

Insects of medical importance

General account on Personal Pests(Lice, Fleas, Bedbugs, Ticks, Scabies mites), Housefly, Cockroach, Biting insects(Mosquitoes, Biting Midges, Sand flies, Black flies, Horse flies, Stable flies).Major insect-born disease and their management; Recent development in Forensic entomology..

(15L)

UNIT V

Pest management

Components of Pest control – physical, mechanical, cultural, chemical and biological control; Pesticide applicators; Pesticide poisoning and first aids; Banned pesticides; General Principles, advantages and disadvantages of Integrated Pest Management; Recent advances in pest control – sterilization techniques, liquid vaporizers, pheromones, RNA interferences, kairomones.

(15L)

(TOTAL: 75L)

REFERENCES BOOKS

1. Abhishek Shkula, 2009. A Handbook on Economic Entomology, Daya Publishing House, India
2. Ganga, G. & Sulochana Chetty, J. 1997. An introduction to Sericulture. Oxford & IBH Publ. Co. Pvt. Ltd., India.
3. David, B.V. & Ramamurthy, V.V. 2016. Elements of Economic Entomology, 8th Edition, Brillion Publishing, India.

PRACTICALS:

1. Head sclerites, thoracic segments, abdominal segments of cockroach
2. Types of antennae. Filiform, Moniliform, Aristate, Capitate, Clavate, Clubbed, Plumose, Pilose, Pectinate, Bipectinate, Setaceous and Geniculate, Lamellate, Serrate. (Any two mountings and rest for study with photo/permanent slides) (Preferably pests)
3. Halter and wings of housefly
4. Types of legs- Typical, Cursorial, Fossorial, Saltatory, Natatorial and Scansorial (Mountings of any two and rest for study with photo/permanent slides).
5. Abdominal appendages- styles, cerci of cockroach.
6. Mouthparts of Cockroach.
7. Malpighian tubules (Cockroach).
8. Collection, preservation and display of 5 insect types (collection and preservation of insects other than pests be discouraged).
9. Common Insecticide formulations (display of samples).
10. Field visit / Assignment / Play and ponder. Give actual handling of bees/ silk moth / lac insect or visit to any one of these units.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.4 C- DAIRY FARMING

5 Hrs/Week

Credits-4

OBJECTIVES:

To introduce various breeds of Indian cows

To describe construction, maintenance of sheds and also introduce the growing and maintenance of dairy animals

To describe how to prevent and manage various diseases of dairy animals

OUTCOME :

Students learned about selection, growing and maintenance of dairy animals

UNIT I

Importance of the study: Live stock in India – Live stock reproduction – Organs – Fertilization – Artificial Insemination – Inheritance – Hybrids – Hybrid Vigor – Grading – Pure breeds – Inbreeding. (15L)

UNIT II

Nutrition – Nutritive values of common feeds – Commercial and mixed feeds – Balance ration. (15L)

UNIT III

Dairy animals – Cattle – Cow – Buffaloes – Goat – Their economic importance – Productivity. (15L)

UNIT IV

Live stock diseases – Common parasites in India – Treatment. (15L)

UNIT V

Marketing the dairy products – Milk and other dairy products – Nutritive values of fresh and preserved products – Combating spoilage of milk – Souring – Gassy Curdling – Robiness – Sweet curdling – Pasteurization. (15L)

(TOTAL:75L)

REFERENCE BOOKS:

1. Principles of Dairy Chemistry. Janness, Robert and Sturte Patton; WileyEastern.
2. Artificial Insemination in Farm animals: Perry Enos (Eds.) Oxford &IBH.
3. Breeding and Improvement of Farm animals: Rice, Victor, Arthur; Tata MCGraw Hill.
4. Livestock and Poultry Production: Singh, Herbans and Earl Moore; Prentice Hallin India.

PRACTICALS:

1. Visit to Pasteurization plant and reporting.
2. On the spot tests of pure milk – Specific gravity, total solids and adulteration of milk.
3. Demonstration of Dairy products – Cream, Butter, Ghee, Khoa, and Ice cream.
4. Identification of cattle diseases – Prevention and Cure-Method of taking temperature in cows.
5. Preparation of Cattle Feed-Balanced food – Identification of different feed plants.
6. Artificial Insemination – Common Surgical Instruments and their uses.
7. Periodical visit to a Good Dairy Farm and Reporting.

SEMESTER VI

MAJOR ELECTIVE (GROUP B) (ANY ONE)

ELECTIVE PAPER: 6.5A -APICULTURE

4 Hrs. / Week

Credits-4

OBJECTIVES:

To examine the scope for self employment opportunities after their graduation account of the rural based and welfare oriented nature of this vocation.

OUTCOME:

Students learned about selection, rearing and maintenance of apiary.

UNIT I

Definition, Scope, Classification of bees, Rock bee, Indian bee, Little bee and Dammer bee- their identification and habits, choice of species in Apiculture.

Bee colony-Distinctive features, Identification and Functions of queen, drones and workers, Structure and functions of Legs, mouth parts and sting of worker bee.

Development of Honey bee-egg, larva and pupa- time taken for the development of queen, drone and worker. Food of the bee- honey and pollen-royal jelly.

Artificial feeding. Behaviour of bees-dances.

(12L)

UNIT II

Principles of Apiculture: Arranging an Apiary- position-space- direction- acquiring bees-care of newly captured colonies-handling the bees.

Bee keeping: Primitive methods and their advantages and disadvantages.

Different types of Modern hives – Architecture - Parts of artificial hive and its advantages – other appliances used in apiaries.

The bee comb and its architecture-Different kinds of cells-Burr comb.

(12L)

UNIT III

Honey bee products:

Honey- Collection and Extraction, Preservation and storage –Physical properties, Chemical composition, nutritive value, medicinal values-honey as daily food.

Bee wax- Production - method of extraction-characteristics and uses.

Bee venom-method of collection - composition of venom- its uses.

(12L)

UNIT IV

Enemies of bees-Greater wax moth, lesser wax moth, ants, wasps, lice, beetles, birds and their management.

Diseases of bees-adult and brood diseases- Bacterial, Fungal, Viral & Protozoan- Prevention and Control measures.

(12L)

UNIT V

Swarming-Prevention and control.

Robbing and Fighting-Prevention and control. Uniting stocks-Different methods. Queen rearing.

Supersedure.

Foraging, inter-relationships of plants and bees.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS:

1. Mishra,R.C. and R. Garg. Perspectives in Indian Apiculture. Agrobios (India)behind Nasrani Cinema, Chopasani Road, Jodhpur-342002.
2. Abrol,D.P. Bee Keeping in India. Kalyani Publishers, B-1/1292, Rajinder Nagar,Ludhiana-141 008.
3. Cherian, M.C. and Ramachandran. Bee Keeping in SouthIndia.
4. Philips, E.F. Bee Keeping,Agrobios (India) behind NasraniCinema,Chopasani Road,Jodhpur-342 002.
5. Sadar Singh, Bee Keeping in India KarDelhi.
6. Sharma P.L and Singh, S.(controller) Hand Book of bee Keeping, printingandStationery,Chandigarh.
7. Webb,A. Bee Keeping for profit and Pleasure, Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodhpur-342002

PRACTICALS

1. Mountings of Legs, mouth parts and sting.
2. Specimen, Model, Slide and Appliances
Queen, worker, Drone, Artificial hive, Queen excluder, smoker, honey extractor, honey, Bee comb and Comb foundation sheet.
3. Report on field visit to Apiary farm/ unit.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.5B - FOOD AND FOOD PROCESSING TECHNOLOGY
4Hrs/ week **Credits-4**

OBJECTIVES:

To understand the physical and chemical properties of food stuff, the methods of preparation of palatable diets and the techniques employed to increase their shelf – life.

OUTCOME

Understood various value added food products and their marketing strategies

UNIT I: FOOD CHEMISTRY

Food chemistry: Definition and importance, water in food, water activity and shelf life of food. Carbohydrates: Chemical reactions, functional properties of sugars and polysaccharides in foods. Lipids: Classification and use of lipids in foods, physical and chemical properties, effects of processing on functional properties and nutritive value. Protein and amino acids: physical and chemical properties, distribution, amount and functions of proteins in foods, functional properties. Effects of processing- Losses of vitamins and minerals due to processing. Pigments in food, food flavours, browning reaction in foods. Enzymes in foods and food industry, Bio-deterioration of foods, food contaminants, additives and toxicants.

(12L)

UNIT II: PRINCIPLES OF FOOD PROCESSING

Scope and importance food processing – National and International perspectives.

Principles and methods of food preservation – freezing, heating, dehydration, canning, additives, fermentation, irradiation, extrusion cooking, hydrostatic pressure-cooking, dielectric heating, microwave processing, aseptic processing, hurdle technology.

Storage of food, modified atmosphere packaging. Refrigeration , freezing and drying of food, Minimal processing, Radiation processing.

(12L)

UNIT III: MILK PROCESSING TECHNOLOGY

Definition of milk, composition, physical and chemical properties of milk Constituents and nutritive value of milk, Factors affecting composition of milk, Types of milk. Fluid Milk

Processing. Receiving, Filtration Clarification, Straining, Standardization, Homogenization and its Effects, Pasteurization and various systems of pasteurization ; LTLT, HTST , UHT methods, Pasteurizes(Heating and Cooling systems ,Flow controller regenerator,Flow division valve) sterilization, packaging of fluid milk. Coagulated Milk Products.

Channa, Paneer, Classification and manufacturing process of cheese, butter and ghee and its storage.

Condensed Milk - Types and factors affecting the quality of Condensed Milk , Storage of condensed milk - Methods of drying milk.(Drum and Spray drying) factors affecting the quality of dry milk. Introduction to instant non-fat dry milk, packaging of dry milk products.

(12L)

UNIT IV: FRUITS AND VEGETABLES TECHNOLOGY

Cleaning, sorting, grading, peeling, and blanching methods and their Equipments, Ingredients and Processes for the manufactures of jam, jellies, marmalade, preserves, pickles and chutneys. Defects and factors affecting the quality of above. Thermal Processing of Fruits and Vegetables: History, definition, various techniques of thermal processing and their effects on the quality of fruits and vegetable products, thermal process time, introduction to concept of thermal process calculations, types of containers and their selection, spoilage of canned food. Dehydration of fruits and vegetables, equipment and process for dehydration of plums, apricot, apple, fig, grapes, peach, cauliflower, potato, mushroom, tomato. Freezing process of selected fruits and vegetables: Peas, beans, cauliflower, apricot and mushroom.

(12L)

UNIT V : TECHNOLOGY OF MEAT, FISH AND POULTRY PRODUCTS

Slaughter of meat animals, different cuts of lamb and their uses, post-mortem inspection – post mortem changes- Loss of homeostasis, post-mortem glycolysis and pH decline, Rigor mortis. Preparatory operations of meats and meat products: Abattior- definition and construction, Basic preparatory procedures (commintion, emulsification, preblending). Cured and smoked meats, sausage products- classifications, processing steps and canned meat, meat pickles.

Handling and Dressing of poultry: Inspection of poultry birds, dressing and preparation of ready to cook poultry, factors affecting the quality- Egg and Egg products- structure, chemical composition and nutritive value, spoilage of eggs and preservation of whole eggs and egg products, preparation of egg powder. Fish and fish products: Types of fish, composition and nutritive value, judging and freshness of fish, fish grading and cooking of fish, smoking, pickling, salting and dehydration , preservation of fish and processed fish products. Frozen storage of fresh and processed meat, fish and poultry. Byproducts of fresh and processed meat, fish, poultry and egg industry.

(12L)

(TOTAL: 60L)

REFERENCE BOOKS:

1. Food processing and nutrition – Bender A.E. – 1978 Academic Press, London.
2. Food processing technology: Principles and Practices. Fellows, P. and Ellis, A.1990,New York.
3. Introduction to food processing – Jelen,P.-1985.Prentice Hall, Reston Virginia, USA.
4. Food Chemistry – Awrand. W andWoods, A.E.1973.AVI,Westport.
5. Food Chemistry – Meyer, L.H.-1973.East West Press Pvt. Ltd, New Delhi.
6. Outlines of Dietary technology –Woarnes.
7. Preservation of fruits and Vegetables – Vijayakhaderkalyani.
8. Preservation of fruits and Vegetables Srivastava, IBD Co. Lucknow.
9. Fish Preservation – S.K. Kulsherestha.
10. Fish Processing and Preservation –C.L.Cutting.
11. Processed Meat- Pearson and Glite – CBS publishes.
12. Poultry, Meat and Egg Products – Parkursht and Mountney.CBS Publishers

PRACTICALS:

1. Determination of Protein, Starch, Sugar, Amino acids, Crude fibers, Total minerals, Crude fat in food stuff.
2. Estimation of Vitamins – Ascorbic acid, Thiamine.
3. Browning reaction in food, Analysis of lipid-saponification value, acid value & Iodine Value.
4. Determination of Tannins-chemical residues and Aflatoxins, Estimation of Preservative and Antioxidants.
5. Platform test of Milk.
6. Determination of SNF, Specific gravity and total solids of milk.
7. Determination of moisture and fat content of milk powder.
8. Determination of adulterants in milk like Water, Urea, Neutralizes, Preservatives and Starch.
9. Preparation of Channa and Paneer.
10. Preparation of different types of milk products and their evaluations.
11. Preparation of fish, Meat, Egg and Vegetable pickles –Demonstration.
12. Estimation of iron sulphide formation in cooked egg.
13. Visit to a Dairy Unit, Different fruit and vegetables processing unit, Slaughter house and observation of different types of cuts made and demonstration of slaughtering, fish processing unit and submit are port.
14. Equipments and appliances used in various food processing industries-observation.

SEMESTER VI
MAJOR ELECTIVE
ELECTIVE PAPER: 6.5C – POULTRYSCIENCE

4Hrs/Week

Credits 4

OBJECTIVES:

- To introduce various breeds of chicks, layers and broilers
- To describe construction, maintenance of poultry keeping and also introduce the rearing and maintenance of poultry
- To describe how to prevent and manage various diseases of poultry

OUTCOME :

Students can get self employed after their graduation. To know about poultry farming and to get deep knowledge about poultry manure, nutrition and various diseases

UNIT I

Poultry industry in India – a brief introduction.

Choosing a commercial laying stock –sexing in one day old chicks. Poultry housing – General principles of building poultry house.

Deep litter system – Droppings pit – Feeders , Waters – Nest boxes. Laying cages – Californian cages – Management of cage birds.

(12L)

UNIT II

Poultry manure – Volume, Composition and values.

Nutritional content of eggs.

Management of Chicks, Growers, Layers and Broilers.

Lighting for Chicks, Growers, Layers and Broilers.

Summer and winter management.

Debeaking.

Forced moulting.

(12L)

UNIT III

Poultry nutrition : Protein and Amino acid requirements for chicks , growers ,layers and broilers – Symptoms of excessive dietary levels and deficiency.

Carbohydrates and Fat requirements for Chicks, Growers, Layers and Broilers– Symptoms of excessive dietary levels and deficiency.

Fibre requirement for poultry feeds.

Requirements of vitamins and inorganic minerals for Chicks, Growers and Layers – Deficiency Symptoms.

(12L)

UNIT IV

Importance of feed additives in a poultry feed.

Preparation of supplementary feed for poultry- South Indian feed ingredients in relation to M.E level, Protein level, Amino acid, Minerals (Ca & P) and Fiber content.

(12L)

UNIT V

Poultry diseases – Causes, Symptoms, Transmission, Treatment, Prevention and Control of the following diseases : Viral diseases - Ranikhit disease, Fowl pox, Bronchitis and Gumboro disease. Infection and control; Bacterial diseases – Fowl typhoid, Paratyphoid, Pullorum, Fowl cholera, Coryza and Mycoplasmosis; Fungal diseases – Aspergillosis and Aflatoxicosis; Parasitic disease- Coccidiosis.

Nematode infections- Tape worm infections; External parasites of chicks – ticks, mites and lice.

(12L)

(TOTAL: 60L)

REFERENCES :

- Poultry keeping – M.R. Gnanamani
- The Rearing of pullets – Bulletin No. 54, Her Majesty's Stationery Office, London
- Intensive Poultry management for egg production. Bulletin No. 152. Her Majesty's Stationery Office, London.
- Nutrition of Chicken - M.L Scott et al.,
Disease of Poultry – Biester Oxford & IBH, Himalaya Publishing House

PRACTICALS :

1. Identification of Ectoparasites of poultry studied in the theory.
2. Identification of Endoparasites.
3. Feeders – Different types.
4. Waterers – Different types.
5. Cage house – Model
6. New Castle disease, Fowl pox, Coryza, Coccidiosis - Diagrams or models
7. Debeaking
8. Visit to a Poultry farm and reporting.

**MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI**

UG COURSES – AFFILIATED COLLEGES

B.Sc. PHYSICAL EDUCATION

(Choice Based Credit System)
(With effect from the academic year 2017 -2018)

Eligibility for Admission to the Course

B.Sc Physical Education, Health Education and Sports

(3 Years course)

a) Applicants should have passed the +2 examination of the Government of Tamil Nadu or any other equivalent examination recognized by the Government of Tam I Nadu or approved by the concerned University.

b) School representation in any game or sports is preferred for the applicants. The procedure followed for the selection of B.P.Ed degree should be followed for B Sc., Physical Education, Health Education and Sports Degree candidates.

c) The candidates should not have completed 21 years of age as on 1stJuly. However, relaxation of 3 years may be given for SC/ST

d) Admission shall be made on the basis of ranking for a total of 150 marks as detailed below.

1. Qualifying Examination	25 marks
2. Participation in Sports and Games	25 marks
3. Games skill test	50 marks
4. Track and Field Skill test	50 marks
Games and Sports participation:	(Maximum Marks:25)
1. Representation for the Country/National placing	25 marks
2. State Representation (Form II/IV in games/Sports)	20 marks
3. Inter Division (Participation) BDS/RDS	15 marks
Inter District (participation)/CBSC CLUSTER	
4. District (BDS/RDS)	10 marks
5. Inter-School Representation	05 marks

All other quota system and rule of reservation of the Government of Tamil Nadu shall be followed.

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B.Sc. PHYSICAL EDUCATION

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III Semester

	Core/Allied	Title	Hours	Credits
Part I	Language	Tamil	6	4
Part II	Language	English	6	4
Part III	Core V	Methods in Physical Education	5	4
Part III	Allied III	Theories of Games-I Kabaddi, Kho-Kho, Handball	3	3
Part III	Skill Based Core I	Sports Medicine	4	4
Part III	Major Practical III	Kabaddi, Kho-Kho, Handball	3+1*	2
Part IV	Non Major Elective I	Fitness and Wellness	2	2
Part IV	Common	Yoga	2	2
		Total	32	25

- Preparatory hours for students

IV Semester

	Core/Allied	Title	Hours	Credits
Part I	Language	Tamil	6	4
Part II	Language	English	6	4
Part III	Core VI	Organization and Administration in Physical Education	5	4
Part III	Major Practical IV	Teaching Practice	3+1*	2
Part III	Non Major Elective II	The Olympic Movement	2	2
	Skill Based Core II	Psychology and Sociology in Physical Education	4	4
Part III	Allied IV	Applied Kinesiology & Bio- mechanics	3	3
Part IV	Common	Computers for Digital era	2	2
Part V	Extension Activity	NSS/NCC/YRC/YWF/PE	0	1
		Total	32	26

- Preparatory hours for students

V Semester

	Core/Allied	Title	Hours	Credits
Part III	Core VII	Exercise Physiology	6	4
	Core VIII	Test, Measurement and Evaluation	6	4
Part III	Core IX	Theories of Track and Field	4	4
Part III	Major Elective I	a. Sports Nutrition b. Sports Journalism	4	4
Part III	Major Practical V	Track Events	4	2
Part III	Major Practical VI	Human Performance Analysis	4	2
Part IV	Skill Based Common	Personality Development/Effective Communication/Youth Leadership	2	2
	Total		30	24

VI Semester

	Core/Allied	Title	Hours	Credits
Part III	Core X	Principles of Sports Training	6	4
	Core XI	Theories of Games (Basketball, Football, Hockey, Cricket, Volleyball)	5	4
Part III	Major Elective II	a. Sports Physiotherapy b. Sports Technology	4	4
Part III	Major Practical VII	Field events	4	2
Part III	Major Practical VIII	Games of specialization (Cricket, Basketball, Volleyball, Hockey, Football)	4	2
Part III	Major Project	Competitions/Training/Survey/Schemes	7	7
	Total		30	23

Total Number of Hours **180**

Total Number of Credits **146**

Part	Core/Allied	Title	Hours	Credits
IV	NME	Fitness and Wellness	2	2

Preamble

Understand the concept of fitness learn the Health and Wellness learn the Principles of Exercise. To create awareness about fitness & its importance in life. To choose appropriate activities for development of specific fitness components.

UNIT – I

Components of Physical fitness – Definition of Strength, Speed, Endurance, Flexibility and Coordination – Health and Wellness .

(5 hours)

Unit II

Prevalence of Physical activity – Barriers to a physically active life style – Medical Evaluation – Fitness Appraisal – Stages of Program Development for Fitness Participants.

(5 hours)

UNIT-III

Principles of Exercise: Ideal Exercise Program – Fitness Concepts – Exercise Guidelines for Children, Adolescence, Adults and Special Groups — Exercise under difficult conditions: Traveling, limited space, injury, busy and visitors.

(10 hours)

UNIT-IV

Fitness Activities: Aerobics, Aquatics, Dance, Brain training, SAQ training, isometric training, cycling, stair climbing, treadmill, walking – Health benefits of physical activity.

(5 hours)

UNIT-V

Home exercise equipment–fitness according to age- Making the right exercise program – Maintaining fitness program - Programme for weight management- personal hygiene

(5 hours)

Total (30 hours)

References

1. Allen W. Jackson et al, Physical Activity for Health and Fitness, USA: Human Kinetics, 1999.
2. Jerrold S. Greenberg et al., Physical Fitness and Wellness (3rd Ed.), USA: Human Kinetics, 2004.

3. Joseph P. Winnick and Francis X. Short, Physical Fitness Training Guide, USA: Human Kinetics, 1999.
4. Edmund R. Burke, Home Fitness: Handbook, USA: Human Kinetics, 1996. Lynne Brick, Fitness Aerobics, USA: Human Kinetics, 1996.
5. Martha White, Water Exercise, USA: Human Kinetics, 1996.
6. Debi Pillarella and Scott O. Roberts, Fitness Stepping, USA: Human Kinetics, 1996.
7. Gudrun Paul, Aerobic Training, Meyer and Meyer sports: Uk, 2000.
8. Bettina M. Jasper, Train your Brain, Meyer and Meyer sports: UK, 1999

Part	Core/Allied	Title	Hours	Credits
IV	Non Major Elective I	Olympic Movement	2	2

Preamble

Understand the origin and modern Olympic movement. Study about the Olympic rings and flag. Describe the Different Olympic Games analyse the Committees of Olympic Games.

Unit – I

Origin of Olympic Movement - Philosophy of Olympic movement - The early history of the Olympic movement - The significant stages in the development of the modern Olympic movement - Educational and cultural values of Olympic movement

(10 hours)

Unit – II

Modern Olympic Games - Significance of Olympic Ideals, Olympic Rings, Olympic Flag

(5 hours)

Unit – III

Olympic Protocol for member countries - Olympic Code of Ethics - Olympism in action - Sports for All

(5 hours)

Unit – IV

Different Olympic Games - Para Olympic Games - Summer Olympics - Winter Olympics - Youth Olympic Games

(5 hours)

Unit – V

Committees of Olympic Games - International Olympic Committee - Structure and Functions - National Olympic committees and their role in Olympic movement - Olympic commission and their functions - Olympic medal winners of India

(5 hours)

Total (30 hours)

Reference:

Osborne, M. P. (2004). Magictree house fact tracker: ancient greece and the olympics: a nonfiction companion to magic tree house: hour of the Olympics. New York: Random House Books for Young Readers.

Burbank, J. M., Andranovich, G. D. & Heying Boulder, C. H. (2001). Olympic dreams: the impact of mega-events on local politics: Lynne Rienner

Part	Core/Allied	Title	Hours	Credits
III	Major Elective	Sports Nutrition / Sports Journalism	4	4

Preamble

Recognize special physiological demands of various levels of physical activity. Determine energy needs for specific types of physical activity. Analyze fluid intake required for various levels and types of physical activity. Understand the nutritional requirements for physical activity. Understand the relationships between diet and training for optimum performance. Plan diets for achievement of optimum weight and peak performance. Discuss current theories related to weight gain/loss and control issues. Outline goals for nutrition management of athletic teams. Identify current controversies in sport nutrition. Discuss human nutrition research and application with other health professionals.

Unit I Meaning Need, Nature and Importance of Nutrition Role of Nutrition on Higher Performance in sports

(10 hours)

Unit II Basics of Nutrition, Carbohydrates, Fats, Proteins, Vitamins, Minerals, Water, Balanced diet, Nutritive value of Food stuffs.

(10 hours)

Unit III Nutrition for Athletes and players, Energy requirements in Sports, Carbohydrate in loading.

(15 hours)

Unit IV Percentage of energy derived from foods, Glycemic Index of food, Dietary fiber of food. Nutritive value of food stuffs.

(15 hours)

Unit V Principles of weight control, Exercise. The Key to successful weight loss management designing weight loss programme. Tips for control body weight.

(10 hours)

Total (60
hours)

References:-

1. Pande P.K. and L.C. Gupta, Putline of Sports Medicine : Jaypee Brothers, New Delhi, 1987.
2. Hoeger W.K. Werner and Sharon A. Hoeger, Fitness and Wellness : Mortor Publishing Company, Englewood, 1990.
3. Goswami Shashikant, Nutrition for sports, SAINSNIS, Patiala, 1996

SPORTS JOURNALISM

Preamble

This class is the introduction to the best practices of sports journalism and more broadly, sports media. Journalism is no longer only the production of ink onto paper, and sports journalism is no exception in that dynamic. The moniker 'toy department' of journalism, which is how some would prefer to think of sports and sports coverage, belies the financial commitment made to sports and sports coverage.

Unit I Sports Journalism - Meaning, Need, Nature and Scope, Aim and Objectives of Mass Communication. Purpose of mass media for the propagation of sports and games Growth of sports communication and periodicals Sports coverage Sports coverage on AIR, T.V and Films
(10 hours)

Unit II Basic Principles of sports reporting. Difference between general news reporting and Sport reporting Source of sports news, Sports spot news Advanced story and flash back Follow up story Basic of Athletic reporting, Basics of Games Reporting, Interviews, Photos, News, Tit-bits.
(10 hours)

Unit III Editing - Techniques Editor - Sub Editors Copy reading and handling sports news Design and makeup of the sports page Typography and various process of printing News paper styles and slant News Structure
(15 hours)

Unit IV Radio & TV Commentary. Differences between Radio & TV Commentary. Experts comments Sports reviews for the radio and T.V
(15 hours)

Unit V Advertising and Newspaper Management. Radio and T.V Advertising News paper organization and management of news paper circulation Ethics and Responsibilities of Sport Journalists.
(10 hours)
Total(60hours)

References :-

1. Gurusamy, Ithazial Kalai, Dindigul : Guru - Themozhi, 2001.
2. Ahuja A.N., Theory and Practice of Journalism, Subject Publication, New Delhi, 1984.
3. Kamath, M.V., Professional Journalism, Vikas Publishing House Ltd., New Delhi, 1981.
4. Puri G.K., 'Journalism, Sudha Publication, Pvt., Ltd., New Delhi.

Part	Core/Allied	Title	Hours	Credits
III	Major Elective II	Sports Physiotherapy / Sports Technology	4	4

Preamble

Understand the Massage Therapy Rheumatic Conditions, acquire knowledge on Technology in Physical Education And Sports learn about Use of ICT in Physical Education learn about rehabilitation of sports injuries.

To understand nature, scope and importance of IT as a school subject. To understand the objectives of teaching IT To apply various methods of teaching IT effectively. To develop adequate skills in the preparation and use of teaching aids. To use various tools of evaluation. To correlate IT with other school subjects

Unit I Meaning, Nature, Need and Importance of Physiotherapy

(10 hours)

Unit II Electricity and Conductor, Short wave diathermy, Microwave diathermy, Diapulse Diathermy, Ultra Sound Waves, Infra red rays, Ultra violent rays - Sources - Effect and uses - Techniques for infra red and ultra violet irradiation.

(10 hours)

Unit III Massage Therapy - Brief History of Massage, Points to be considered in giving massage, classification of the Manupulations used in massage. The Technique, the Effect, uses, Indication and contra- Indications of all manupulations.

(15 hours)

Unit IV Rheumatic Conditions - Classification – Rhumatoid Arthritis – Spondylitis - Acute respiratory conditions - Chronic respiratory conditions -Conditions of the Nervous System. Introduction, Sign and Symptoms of neurological disorders like Paraplegia, Hemiplegia, Cerebral Palsy. Various infections of the Nervous System-Meningites, Poliomyetitis, cerebral palsy.

(15 hours)

Unit V Conditions of the cardio vascular system - Introduction, heart failure, classification carelitis.-Sign and symptoms and prevention-Chronic vascular disorders, coronary occlusion and Efforts requiring hypertension- Dis-orders of the blood vessels- Atherosilerosis, cold extremities, various thrombosis - Fracture of the upper extremity and lower extremity - Dislocation

(10 hours)

References:

- 1) Joan, N. Laan, "Physiotherapy in Medical Conditions"
- 2) Thorndike, "Athletic Injuries"
- 3) Joan, "Physiotherapy in Surgical conditions"
- 4) Henry, C. Kondal and Florence P. Kondal, Muscle and Functions.
- 5) I.B. Clayton, "Text Book of Electrotherapy" and Actiontherapy
- 6) Branda Savage, "Preliminary electricity for the Physiotherapist"
- 7) Edwin M. Prasnet, "Manual of Massage and Movements"
- 8) R. Foracks, "Exercise Therapy"
- 9) M.V.Locs, "Manual of Massages"
- 10) Adish Luchwald, "Physical Rehabilitation for Daily Living"

Sports Technology

UNIT-I

Technology In Physical Education And Sports - Initiating technology - Use of Audio/Video technology - Image analysis

(10 Hours)

Unit II

Technological devices used in Physical activity and sports (underwater camera, various measuring tools, wind gauges, foul indicators, electronic gadgets, adobe Photoshop, Microsoft animation, laser beam technology, LCD display)

(15 Hours)

UNIT-III

Use of ICT in Physical Education - Computer analysis instructional software - Using technology to improve instructional process

(10 Hours)

Unit IV

Use of World Wide Web - Power point presentation - Assessing student learning.

(10 Hours)

UNIT-V

Meaning, types and importance of Teaching methods; Factors effecting Teaching Methods; Presentation Techniques – Personal and Technical preparation; Meaning and importance of Audio-visual Aids in Physical Education; Meaning and types of command; Steps/stages in teaching Motor Skill;

(15 Hours)

Total (60 hours)

REFERENCES

1. Brar, R.S. et al. Teaching Methodology and Educational Technology in Physical Education, Kalyani Publisher: New Delhi, 2008.
2. Hoover, Kenneth H. The Professional Teacher's Handbook, Boston, Allyn and Bacon, 1972.
3. Krik, David. Physical Education and Curriculum Study, Kent, Croom Helm, 1988.
4. Mohanty, J. Educational Technology, New Delhi, 1992.
5. Wessel Janet A, and Kelly Luke. Achievement-Based Curriculum Development in Physical Education, Philadepia, Lea and Febiger, 1986

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES
B.Sc. PHYSICAL EDUCATION
(Choice Based Credit System)
(with effect from the academic year 2021-22 onwards)

Vision of the University

To provide quality education to reach the un-reached

Mission of the University

- To conduct research, teaching and outreach programmes to improve conditions of human living.
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity.
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development.
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

Vision of the Department

Creating a sporty and fit nation through Physical Education and Sports

Mission of the Department

- To conduct research, teaching and outreach programmes to improve health conditions and sports performance of human being.
- To collaborate with stakeholders to improve the standard of living and to serve as catalyst for fitness and wellness.
- To provide quality / inclusive physical education.
- To provide opportunities to develop the knowledge, skills, and personalities necessary to meet their personal and professional goals.
- To move towards a more physically active lifestyle by changing behavioural patterns.
- To create the sports culture at the grass-root level.

Preamble

Physical Education is a form of one of the most effective means of education imparted through physical exercises, recreational activities and sports. It is an integral part of education. Which by mere participation in it gives the outcomes. These outcomes are both instant as well as have strong carry over values in the life. The children as well as the adults and the old enjoy physical activities & sports and gets benefit in the form of stronger muscles and bones, increased energy, coordination level and most importantly the decreased risk of developing chronic diseases.

The UNESCO in its General Conference in 1978 was convinced that, everyone should be free to develop and preserve his or her physical, intellectual and moral powers. Physical Education, Health Education and Sports should consequently be assured and guaranteed for all human beings. Physical Education is now a regular feature in the primary and secondary schools as well as it is gaining popularity in the higher education. The course opted for this is elective as well as the core at the college and the university level in India.

The graduate level course in Physical Education, Health Education and Sports contains subjects varying from foundation of Physical Education to Anatomy, Physiology, Kinesiology, Test & Measurement, Nutrition, Rehabilitation, Psychology, Sports Training, Sports Biomechanics, Methods of Teachings etc. which are aimed to give thorough knowledge and skills to the students. Students perusing physical education courses are fit to join the jobs as physical trainers, coaches, game officials, referees, umpires, curators, gym trainers, life guards, personal trainers etc. During their course of education the students also develops the expertise to establish their own business as entrepreneurs in the field of sports, fitness, recreation, adventure sports, camping, event management etc.

Learning Outcomes-Based Curriculum Framework

The learning outcomes-based curriculum framework for a B.Sc degree in Physical Education is intended to provide a broad framework within which Physical Education programme responds to the needs of students and requirements. The framework is expected to assist in the maintenance of standard and uniformity of Physical Education degrees across the country. This will also help in periodic programme review within a broad framework of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework does seek to bring about uniformity in syllabi for a programme of study in Physical Education, teaching-learning process as well as learning assessment procedures. However, the framework is also intended to allow flexibility and innovation in programme design.

Nature and extent of the B.Sc. degree programme

Physical Education is normally referred to as the science that aims to develop all-inclusive aspects of human personality through physical and sports activities. Physical education is a multidisciplinary subject that cannot be studied in seclusion under the scope of one or two subjects. The scope of Physical Education as a subject is very broad. It caters to the need for developing capability of the students on physical, mental and social aspects. Physical education also aims to develop activity as an alternate and prophylactic medicine. The key areas of study within the Physical Education are *'Exercise Physiology, Sports Psychology, Sports Sociology, Sports Management, Sports Journalism, Kinesiology- Biomechanics, Sports Training, Sports Medicine, Kinanthropometry* etc.

Degree program in Physical Education covers topics that overlap with the areas outlined above and that address the interfaces of Physical Education with other subjects such as Physiology, Bio-Chemistry, Physics, Physiotherapy, Psychology, Management, Sociology along with training pedagogy employed for enhancing the functional status of individuals with varied needs. As a part of the effort, to enhance the employability of graduates of Physical Education, programs include learning experiences that offer opportunities in various spheres of human existence.

Program Specific Outcomes (PSOs)

This would lead the students to understand historical concept of physical education and relationship between Philosophy, Education and Physical Education. The student would further understand the theoretical implications of philosophies of physical education with modern development and social aspects of Physical Education.

1. The curriculum would enable the pass out to select the inherited talented children for various sports activities.
2. The pass out shall be able to orient children in schools with the fundamental skills of selected sports as per their inherited potential.
3. The pass out shall be able to devise training program for athletes engaged in different sports activities
4. The curriculum shall enable them to officiate, supervise various sports tournaments and orient them in organizing sports events at all levels.
- A. The curriculum would enable the pass out students to be entrepreneur (to start their own fitness centre, gym, spa etc) and device appropriate fitness program for different genders and age groups of people.
5. The curriculum would enable the pass out to devise training program for physically challenged peoples.

Eligibility for Admission to the programme B.Sc Physical Education, Health Education and Sports (3 Years)

- A. Applicants should have passed the +2 examination of the Government of Tamil Nadu or any other equivalent examination recognized by the Government of Tam I Nadu or approved by the concerned University.
- B. School representation in any game or sports is preferred for the applicants. The procedure followed for the selection of B.P.Ed degree should be followed for B Sc., Physical Education, Health Education and Sports Degree candidates.
- C. The candidates should not have completed 21 years of age as on 1stJuly. However, relaxation of 3 years may be given for SC/ST.

Admission shall be made on the basis of ranking for a total of 150 marks as detailed below

- | | |
|--------------------------------------|----------|
| 1. Qualifying Examination | 25 marks |
| 2. Participation in Sports and Games | 25 marks |
| 3. Games skill test | 50 marks |
| 4. Track and Field Skill test | 50 marks |

Games and Sports participation:

(Maximum Marks:25)

- | | |
|--|----------|
| 1. Representation for the Country/National placing | 25 marks |
| 2. State Representation (Form II/IV in games/Sports) | 20 marks |
| 3. Inter Division (Participation) BDS/RDS
Inter District (Participation)/CBSC CLUSTER | 15 marks |
| 4. District (BDS/RDS) | 10 marks |
| 5. Inter-School Representation | 05 marks |

All other quota system and rule of reservation of the Government of Tamil Nadu shall be followed.

Course-level learning outcomes

The undergraduate degree program of Physical education will be of three years with six semesters. The Course-level learning outcomes for each course within B.Sc degree programme in Physical Education are given below with content matter (detail syllabus of five units) to be taught in each unit and semester for three years

Scheme of Examination 2021-22(Semester I-VI)

SEMESTER I				
PART	Core/Allied	Title	Hours	Credits
Part I	Language	Tamil	6	4
Part II	Language	English	6	4
Part III	Core I	Foundation of Physical Education and Gymnastics	5	4
Part III	Core II	Professional English	4	4
Part III	Major Practical-I	Gymnastics	2	2
Part III	Allied I	Basic Anatomy and Physiology	3	3
Part III	Allied Practical - I	Kinanthropometry	2	2
Part IV		Environmental Studies	2	2
		Total	30	25
SEMESTER II				
PART	Core/Allied	Title	Hours	Credits
Part I	Language	Tamil	6	4
Part II	Language	English	6	4
Part III	Core III	Theories of Games-I (Kabaddi, Kho-Kho, Handball)	5	4
Part III	Core IV	Professional English	4	4
Part III	Major Practical II	Kabaddi, Kho-Kho & Handball	4	2
Part III	Allied II	Health Education, Safety Education and First aid	3	3
Part IV		Value Based Education	2	2
		Total	30	23
SEMESTER III				
PART	Core/Allied	Title	Hrs	Credits
Part I	Language	Tamil	6	4
Part II	Language	English	6	4
Part III	Core V	Methods in Physical Education	5	4
Part III	Allied III	Theories of Games-II (Badminton, Ball Badminton & Tennis)	3	3
Part III	Skill Based Core I	Principles of Sports Training	4	4
Part III	Core Practical III	Badminton, Ball Badminton & Tennis	4	2
Part IV	Non Major Elective I	Principles of Physical Literacy	2	2
Part IV	Common	Yoga	2	2
		Total	32	25
SEMESTER IV				
PART	Core/Allied	Title	Hrs	Credits
Part I	Language	Tamil	6	4
Part II	Language	English	6	4
Part III	Core VI	Organization and Administration in Physical Education	5	4

Part III	Core Practical IV	Teaching Practice	4	2
Part III	Non Major Elective II	Fitness and Wellness	2	2
Part III	Skill Based Core II	Sports Psychology and Sociology	4	4
Part III	Allied IV	Sports Biomechanics and Kinesiology	3	3
Part IV	Common	Computers for Digital era	2	2
Part V	Extension Activity	NSS/NCC/YRC/YWF/PE	0	1
		Total	32	26
SEMESTER V				
PART	Core/Allied	Title	Hrs	Credits
Part III	Core VII	Exercise Physiology	5	4
	Core VIII	Test, Measurement and Evaluation in Physical Education and Sports	5	4
Part III	Core IX	Theories of Track and Field	5	4
Part III	Core Elective I	a. Principles of Motor Development	5	4
		b. Adapted Physical Education		
Part III	Core Practical V	Track and Field Events	4	2
Part III	Core Practical VI	Measurement and Evaluation in Human Performance	4	2
Part IV	Skill Based Common	Personality Development / Effective Communication / Youth Leadership	2	2
		Total	30	22
SEMESTER VI				
PART	Core/Allied	Title	Hrs	Credits
Part III	Core X	Athletic Care, Sports Injuries and Rehabilitation	5	4
Part III	Core XI	Theory of Games – III (Basketball, Football, Hockey, Cricket, Volleyball)	5	4
Part III	Core XII	Elementary Statistics in Physical Education	5	4
Part III	Core Elective II	a. Sports Nutrition	5	4
		b. Sports Journalism		
Part III	Project & Viva	Project & Viva - State/National Level Tournament (Or) Study Tour	5	2
Part III	Core Practical VII	Games of Specialization (Basketball, Football, Hockey, Cricket, Volleyball)	5	2
	Total		30	20

On completion of the course, the students will be able to

CO No.	Allied - III - Theories of Games - II (Badminton, Ball Badminton & Tennis)	Cognitive Level
CO 1	develop the understanding and knowledge regarding the Racket parts, racket grips, shuttle grips, The basic stances	
CO 2	develop the understanding and knowledge of The basic strokes-serve forehand-overhead and underarm, backhand-overhead and underarm	
CO 3	gain knowledge of Drills and lead up games, Types of games-singles, doubles, including mixed doubles	
CO 4	gain knowledge of Rules and their interpretations and duties of officials	
CO 5	learn the rules and regulations and current interpretation of new changes in the games.	

Remember (K1); Understand (K2); Apply (K3); Analyze (K4); Evaluate (K5); Create (K6)

Mapping COs with Pos and PSOs

COs	POs						PSOs					
	1	2	3	4	5	6	1	2	3	4	5	6
1	H	M	M	M	L	H	L	M	H	M	H	L
2	H	M	M	M	H	H	M	H	H	M	H	L
3	H	M	L	L	M	L	M	H	H	M	H	L
4	H	M	L	L	H	L	M	M	H	M	H	L
5	H	M	L	L	H	L	L	M	H	M	H	M

Highly Correlated (H); Moderately Correlated (M); Weakly Correlated (L)

MSU/ 2021-22 / UG-Colleges /Part-IV (B.Sc. Physical Education) / Semester – III / Non Major Elective I

Part IV	Non Major Elective I	Principles of Physical Literacy	2 hrs	2 Credits
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Learning outcomes:

6. Understand the basic concept of Movement Education and Physical Literacy
7. Know about motor skills and movement pattern
8. Learn about the movement concepts
9. Understand and apply the concept of participation in Physical Activity

UNIT-1: Introduction

(6 hours)

Definition, Meaning & Importance of Movement Education- Definition, Meaning & Importance of Physical Literacy- Concept of developmentally Appropriate Physical Activities.

UNIT 2 - Motor Skill & Movement Pattern

(6 hours)

Classification of Motor Skills: Fundamental (Locomotor, Non-locomotor, Manipulative Skill), Specialized (Manipulative, Rhythmic Movement, Game & Sport Skills).

UNIT III – Movement Concepts**(6 hours)**

Introduction to Movement Concepts, Development of Movement Concepts: Space Awareness, Effort Concepts, Relationships- Long Term Athlete Development (LTAD)

UNIT IV Personal & Social Development**(6 hours)**

Personal Development: Self-concept, Cognitive Functioning and Motivational outcomes - Social Development: Altruism, Controlling Aggression, Cooperation, Group development.

UNIT V – Sports for Development**(6 hours)**

Sport for Development: Sport for Education, Economic, Gender, Health and Peace.

Teaching Learning Strategies: The class will be taught by using lectures and demonstration, seminars, classroom discussion, videos, charts and presentations method.

Activities: Lecture/Project Work/ Seminars/Term Papers/Assignments/Study etc.

Assessment Rubrics: Classroom Test, Project Work, Assignments, Presentations

References:

1. Abels, K. & Bridges, J. M. (2010) Teaching Movement Education: Foundations for Active Lifestyles. Champaign, IL: Human Kinetics Publishers.
2. Graham, G., Holt, Shirley & Parker, Melissa. (1993). Children Moving A Reflective Approach to Teaching Physical Education. New York: McGraw Hill Education.
3. Lund, J., Tannehill & Lund, Jacalyn. (2010). Standards-Based Physical Education Curriculum Development, 2nd Edition. Jones & Barlett Learning.
4. Frank, A. M (2003). Sports and Education: A Reference Handbook (Contemporary Education Issues), ABC-CLIO.
5. Ciccomascolo, L. E. & Sullivan, E. C. (2013). The Dimensions of Physical Education. Jones & Barlett Learning.
6. Pangrazi, R. P. (1998). Dynamic of Physical Education for Elementary School Children 12th Ed). Allyn & Bacon.
7. Griffin, L. & Butler, J. (2005). Teaching Games for Understanding: Theory, Research, and Practice. Champaign, IL: Human Kinetics Publishers.

Course Outcomes

On completion of the course, the students will be able to

CO. No.	Non Major Elective I - Principles of Physical Literacy	Cognitive Level
CO1	Develop the motivation and ability to understand, communicate, apply and analyse various forms of movement	
CO2	Demonstrate a variety of movements confidently and competently across a wide range of physical activities	
CO3	Make healthy, active choices that are both beneficial to and respectful of their selves, others and environment.	
CO4		
CO5		

Remember (K1); Understand (K2); Apply (K3); Analyze (K4); Evaluate (K5); Create (K6)

**MSU/ 2021-22 / UG-Colleges /Part-IV (B.Sc. Physical Education) /
Semester – IV / Non-Major Elective II**

Part IV	Non Major Elective II	Fitness and Wellness	2 hrs	2 Credits
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Learning outcomes:

Enable students to

1. Understand the essentials of lifelong wellness
2. Understand the essentials of Physical fitness
3. Overcome fitness barriers and involve in physical activity
4. Know the procedure to assess the fitness

Unit I – Introduction

(6 Hours)

Definition, Meaning, Concept of Fitness and Wellness – Need for and importance of Fitness and Wellness.

Unit II - Aging Process

(6 Hours)

Aging – Factors influence Aging – Healthy aging – Wellness – Sports as a hobby and Stress management through exercise.

Unit III - Types of Fitness and Wellness

(6 Hours)

Physical fitness – Physiological fitness - Functional fitness – Mental fitness – Social Fitness

Unit IV –Management of Obesity and Diabetes

(6 Hours)

Obesity-Causes of Obesity-Weight Management – Diabetes – causes of diabetes

Unit V – Assessment of Fitness

(6 Hours)

Test for Endurance, Strength, Flexibility and Speed (Only one test from each category)

Teaching Learning Strategies: The class will be taught by using lectures and demonstration, seminars, classroom discussion, videos, charts and presentations method.

Activities: Lecture/Project Work/ Seminars/Term Papers/Assignments/Study etc.

Assessment Rubrics: Classroom Test, Project Work, Assignments, Presentations

References:-

1. Hoeger, Werner, W. K., & Hoeger, Sharon, A. (1990). Fitness and Wellness. Englewood: Morton publishing Company.
2. Hazedine, (1985). Fitness for Sports. Ramsburg: The Crowood Press Ltd.
3. James & Hart, L., (1983). 100% Fitness, New Delhi: Goodwill Publishing House.
4. Anspaugh, D. J., Hamrick, M. H., & Rosato, F. D. (1991). Wellness: Concepts and applications. New York: McGraw-Hill.
5. Arumugam, S., & Sivagnanam, P. (2019). Fitness and Wellness. Madurai: Shanlax Publications.

Course Outcomes

On completion of the course, the students will be able to

CO No.	Non Major Elective II - Fitness and Wellness	Cognitive Level
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Mapping COs with Pos and PSOs

COs	POs						PSOs					
	1	2	3	4	5	6	1	2	3	4	5	6
1	H	L	M	M	L	H	L	M	H	H	L	M
2	H	L	M	M	H	H	L	M	H	H	L	M
3	H	L	M	L	M	H	L	M	H	H	L	M
4	H	L	M	H	L	H	L	M	H	H	L	M
5	H	L	M	H	H	H	L	M	H	H	L	M

Highly Correlated (H); Moderately Correlated (M); Weakly Correlated (L)

MSU/ 2021-22 / UG-Colleges /Part-III (B.Sc. Physical Education) / Semester – V / Core Elective I

Part III	Core Elective I	Principles of Motor Development	4 hrs	4 Credits
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Learning outcomes:

1. Understand the basic Motor development
2. Know about physical growth, maturation and aging
3. Understand and study the motor skills and movement concepts
4. Understanding the concept of Constraints in Motor Development.

Unit I - Introduction

(12 Hours)

Definition: Motor Development, Motor Learning, Motor Control–Theoretical perspectives of Motor Development- Concept of Physical Literacy -Age classification.

Unit II - Physical Growth and Aging

(12 Hours)

Physical growth, maturation and Aging – Types of Motor Skills – Movement milestones in children, Long Term Athlete Development (LTAD)

Unit III – Motor Skills

(12 Hours)

Classification of Motor Skills: Fundamental (Locomotor, Non-locomotor, Manipulative Skill), Specialized (Manipulative, Rhythmic Movement, Game & Sport Skills)

Unit IV – Movement Concepts

(12 Hours)

Development of Movement Concepts: Space Awareness, Effort Concepts, Relationships – Postural control and balance

Unit V – Perceptual Motor Development and Constraints

(12 Hours)

Sensory-perceptual development – Perception in Motor development – Social and Psychosocial constraints -

Teaching Learning Strategies: The class will be taught by using lectures and demonstration, seminars, classroom discussion, videos, charts and presentations method.

Activities: Lecture/Project Work/ Seminars/Term Papers/Assignments/Study etc.

Assessment Rubrics: Classroom Test, Project Work, Assignments, Presentations

References:

1. Kathleen M.Haywood., & Nancy Getchell., (2009). *Life Span motor Development*(5th Ed.), Champaign, IL: Human Kinetics,
2. Robert M. Malina., Claude Bouchard &oded Bar-Or., (2004). *Growth, Maturity and Physical Activity*(2nd Ed.), Champaign, IL: Human Kinetics.
3. NAPSE., (2005). *Physical Education for Lifelong Fitness*(2nd Ed.), Champaign, IL: Human Kinetics.
4. Allen W. Jackson., James R. Morrow., Jr.David W. Hill & Rod K. Dishman., (2004). *Physical Activity for Health and Fitness*, Champaign, IL: Human Kinetics.
5. Cratty Bryant, J. (1975). *Movement Behaviour and Motor Learning*. Philadelphia Lea &Febiger.

Course Outcomes

On completion of the course, the students will be able to

CO. No.	Core Elective I - Principles of Motor Development	Cognitive Level
CO1	Define motor learning and its relationship to other related disciplines	K1
CO2	Define motor control, motor development, motor behaviors, and motor performance	K3
CO3	Understand how learned motor learning principles can be applied to various professions such as physical education, exercise and sports science, sports coaching, physical therapy, the military, police and special forces, ballet and other dance forms, recreational activities, etc.	K3
CO4	Understand the importance of using new technology or training methods for the enhancement of the motor learning process	K3
CO5	Understand the factors contributing to motor learning performance	K3

Remember (K1); Understand (K2); Apply (K3); Analyze (K4); Evaluate (K5); Create (K6)

Mapping COs with Pos and PSOs

COs	POs						PSOs					
	1	2	3	4	5	6	1	2	3	4	5	6
1	H	L	M	M	L	H	L	M	H	H	L	M
2	H	L	M	M	H	H	L	M	H	H	L	M
3	H	L	M	L	M	H	L	M	H	H	L	M
4	H	L	M	H	L	H	L	M	H	H	L	M
5	H	L	M	H	H	H	L	M	H	H	L	M

Highly Correlated (H); Moderately Correlated (M); Weakly Correlated (L)

**MSU/ 2021-22 / UG-Colleges /Part-III (B.Sc. Physical Education) /
Semester – V / Core Elective I**

Part III	Core Elective I	Adapted Physical Education	4 hrs	4 Credits
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Learning outcomes:

1. The knowledge would enable the students to understand the activity requirements of various levels of physically challenged persons.
2. The knowledge would thus enable the students to prepare and organize worthwhile activity programs for various levels of physically challenged persons.

Unit I Introduction

(12 Hours)

Meaning, Definition and Importance of Adapted Physical Education and Sports - Purpose, Aims and Objectives of Adapted Physical Education and Sports - Program organization of Adapted Physical Education and Sports - Organizations addressing and giving opportunities to people with disabilities. - Adapted Sports- Para Olympics and other Opportunities

Unit II - Development of Individual Education Program (IEP)

(12 Hours)

The student with a disability - Components and Development of IEP - Principles of Adapted Physical Education and Sports - Role of Physical Education teacher

Unit III – Motor Developmental Considerations

(12 Hours)

Motor development - Perceptual Motor development - Early childhood and Adapted Physical Education - Teaching style, method and approach in teaching Adapted Physical Education

Unit-IV - Individual with unique need and activities

(12 Hours)

Behavioral and Special learning disability - Visual Impaired and Deafness

Unit-IV – PE for Special Children

(12 Hours)

Health Impaired students and Physical Education - HRPF and its development for Individual with unique need - Role of games and sports in Adapted Physical Education

Teaching Learning Strategies: The class will be taught by using lectures and demonstration, seminars, classroom discussion, videos, charts and presentations method.

Activities: Lecture/Project Work/ Seminars/Term Papers/Assignments/Study etc.

Assessment Rubrics: Classroom Test, Project Work, Assignments, Presentations

References:

1. Beverly, N. (1986). Moving and Learning. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. (2005). Adapted Physical Education in the Mainstream (4th ed.). Love Publishing Company.
3. Winnick J & David L. Porretta (2021). Adapted Physical Education and Sports (6th ed.). Champaign, IL: Human Kinetics.
4. Martin. E. B., (2021). A Teacher's Guide to Adapted Physical Education: Including Students with Disabilities in Sports and Recreation. Champaign, IL: Human Kinetics.
5. Michael Horvat, Luke E. Kelly, Martin E. Block, Ron Croce. (2018). Developmental and Adapted Physical Activity Assessment. Champaign, IL: Human Kinetics

Course Outcomes

On completion of the course, the students will be able to

CO. No.	Core XII - Elementary Statistics in Physical Education	Cognitive Level
CO1	understandtheimportanceofstatisticsinphysicaleducation.	K4
CO2	Understandandapplythestatisticsinresearch.	K4
CO3	Understandandapplythebasicsofstatisticsinresearch	K2
CO4	learnthebasicandadvancedstatistics.	K3
CO5	knowthegraphicalrepresentationofstatistics.	K2

Remember (K1); Understand (K2); Apply (K3); Analyze (K4); Evaluate (K5); Create (K6)

Mapping COs with Pos and PSOs

COs	POs						PSOs					
	1	2	3	4	5	6	1	2	3	4	5	6
1	H	L	M	M	L	H	L	M	H	H	L	M
2	H	L	M	M	H	H	L	M	H	H	L	M
3	H	L	M	L	M	H	L	M	H	H	L	M
4	H	L	M	H	L	H	L	M	H	H	L	M
5	H	L	M	H	H	H	L	M	H	H	L	M

Highly Correlated (H); Moderately Correlated (M); Weakly Correlated (L)

MSU/ 2021-22 / UG-Colleges /Part-III (B.Sc. Physical Education) / Semester – VI / Core Elective II

Part III	Core Elective II	Sports Nutrition	5 hrs	4 Credits
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Learningoutcomes:

1. Develop skillsto establishdailycaloricrequirement andto designthedietplan.
2. Acquaintstudentwithprinciplesofsportsnutrition.
3. Orientthestudenttotherole offoodon physicalperformance.
4. Understand andprepareweightmanagementplans.

Unit I - Introduction

(15 Hours)

MeaningandDefinition ofSportsNutrition - Basic componentsofNutrition
Factortoconsiderfordevelopingnutritionplan – Balancedietanditscomponents,Nutritionaldeficiencies –
Understandingof malnutrition andnutritional supplements.

Unit II - Nutrients:Ingestionto energy metabolism

(15 Hours)

Basics of Nutrition, Carbohydrates, Fats, Proteins, Vitamins, Minerals, Water, Nutritive value of Food
stuffs.

Unit III – NutritionandWeightManagement

(15 Hours)

Nutrition for Athletes and players - Energy requirements in Sports - Percentage of energy derived from foods - Glycemic Index of food - Nutritive value of food stuffs.

Unit IV – Ergogenic aids (15 Hours)

Meaning of ergogenic aids – advantages and disadvantages of ergogenic aids - Types of ergogenic agents – Carbohydrate loading.

Unit V – Steps of Planning of Weight Management (15 Hours)

Principles of weight control, Exercise. The Key to successful weight loss management designing weight loss programme. Tips for control body weight.

Teaching Learning Strategies: The class will be taught by using lectures and demonstration, seminars, classroom discussion, videos, charts and presentations method.

Activities: Lecture/Project Work/ Seminars/Term Papers/Assignments/Study etc.

Assessment Rubrics: Classroom Test, Project Work, Assignments, Presentations

References:

1. Bessesen, D.H. (2008). Update on obesity. J Clin Endocrinol Metab. 93(6), 2027-2034.
2. Butryn, M.L., Phelan, S., & Hill, J. O. (2007). Consistent self-monitoring of weight: a key component of successful weight loss maintenance. Obesity (Silver Spring). 15(12), 3091-3096.
3. Chu, S.Y. & Kim, L. J. (2007). Maternal obesity and risk of stillbirth: a meta analysis. Am J Obstet Gynecol, 197(3), 223-228.
4. Bates M. (2008). Health Fitness Management (2nd ed.) Champaign, IL: Human Kinetics.
5. Shashikant, G., (1996). Nutrition for sports, SAINSNIS, Patiala.

Course Outcomes

On completion of the course, the students will be able to

CO. No.	Core Elective II - Sports Nutrition	Cognitive Level
CO1	understand the role of nutrition and weight management on sports.	K2
CO2	learn the importance of carbohydrates, fat and protein during	K3
CO3	learn the health risks and solutions for overcoming obesity.	K3
CO4	know to design diet plan for weight gain and weight loss.	K4
CO5	understand the role of physical activity in weight management.	K4

Remember (K1); Understand (K2); Apply (K3); Analyze (K4); Evaluate (K5); Create (K6)

Mapping COs with Pos and PSOs

COs	POs						PSOs					
	1	2	3	4	5	6	1	2	3	4	5	6
1	H	L	M	M	L	H	L	M	H	H	L	M
2	H	L	M	M	H	H	L	M	H	H	L	M
3	H	L	M	L	M	H	L	M	H	H	L	M
4	H	L	M	H	L	H	L	M	H	H	L	M
5	H	L	M	H	H	H	L	M	H	H	L	M

Highly Correlated (H); Moderately Correlated (M); Weakly Correlated (L)

**MSU/ 2021-22 / UG-Colleges /Part-III (B.Sc. Physical Education) /
Semester – VI / Core Elective II**

Part III	Core Elective II	Sports Journalism	5 hrs	4 Credits
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Learning outcomes:

The students will be oriented in basic art of mass communication and reporting of sports events through various mediums.

UnitI – Introduction

(15 Hours)

Meaning and Definition of Journalism - Ethics of Journalism - Sports Ethics and Sportsmanship - Reporting Sports Events - National and International Sports News Agencies.

UnitII - Sports Bulletin

(15 Hours)

Concept of Sports Bulletin - Types of bulletin - Journalism and sports education - Structure of sports bulletin – Compiling a bulletin - General news reporting and sports reporting.

UnitIII - Mass Media

(15 Hours)

Mass Media in Journalism: Radio and T.V - Commentary – Running commentary on the radio – Sports expert’s comments - Role of Advertisement in Journalism - Sports Photography - Editing and Publishing.

UnitIV - Report Writing on Sports

(15 Hours)

Brief review of Olympic Games, Asian Games, Common Wealth Games World Cup, National Games and Indian Traditional Games - Preparing report of an Annual Sports Meet for Publication in Newspaper.

UnitV – Press Meet

(15 Hours)

Organization of Press Meet - Practical assignments to observe the matches and prepare report and news of the same - Visit to News Paper office and TV Centre to know various departments and their working

Teaching Learning Strategies: The class will be taught by using lectures and demonstration, seminars, classroom discussion, videos, charts and presentations method.

Activities: Lecture/Project Work/ Seminars/Term Papers/Assignments/Study etc.

Assessment Rubrics: Classroom Test, Project Work, Assignments, Presentations

References:

1. Ahiya B.N. (1988). Theory and Practice of Journalism. Delhi: Surjeet Publications
2. Ahiya B.N., & Chobra S.S.A. (1990). Concise Course in Reporting. New Delhi: Surjeet Publication.
3. Bhatt S.C. (1993). Broadcast Journalism Basic Principles. New Delhi. Haranand Publication.
4. Joshi, D., (2010). Value Education in Global Perspective. New Delhi: Lotus Press.
5. Kannan, K., (2009). Soft Skills, Madurai: Madurai: Yadava College Publication
6. Chakrabarti, M., (2008). Value Education: Changing Perspective, New Delhi: Kanishka Publication.

B.B.A., GENERAL

SYLLABUS

**FROM THE ACADEMIC YEAR
2023 – 2024**



**MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI - 627012**

SEMESTER I		SUBJECTS	L	T	P	O	Hrs/week	CREDIT	MAX MARKS		TOTAL
COURSE COMPONENT									CIA	External	
Part I	Paper-I	Language – Tamil	Y	-	-	-	6	3	25	75	100
Part II	Paper-I	English	Y	-	-	-	6	3	25	75	100
Part III	Core Paper-I	Principles of Management	Y	-	-	-	5	5	25	75	100
	Core Paper-II	Accounting for Management I	Y	-	-	-	5	5	25	75	100
	Elective Paper-I	Managerial Economics	Y	-	-	-	4	3	25	75	100
Part IV	Skill Enhancement course SEC 1 - Basics of Event Management		Y	-	Y	-	2	2	25	75	100
	Foundation Course BBA FC 01- Managerial Communication						2	2	25	75	100
	Total						30	23			

SEMESTER II		SUBJECTS	L	T	P	O	Hrs/week	CREDIT	MAX MARKS		TOTAL
COURSE COMPONENT									CIA	EXT	
Part I	Paper-II	Language – Tamil	Y	-	-	-	6	3	25	75	100
Part II	Paper-II	English	Y	-	-	-	6	3	25	75	100
Part III	Core Paper-III	Organisational Behaviour	Y	-	-	-	5	5	25	75	100
	Core Paper-IV	Accounting for Management - II	Y	-	-	-	5	5	25	75	100
	Elective -II	Business Regulatory Frame Work	Y	-	-	-	4	3	25	75	100
Part IV	Skill Enhancement course SEC 2 - Managerial Skill Development		Y	-	-	-	2	2	25	75	100
	Skill Enhancement course SEC 3 Business Etiquette and Corporate Grooming						2	2	25	75	100
Total						30	23				

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
BBA DGE01	Managerial Economics	Gen eric Elec tive	Y	-	-	-	3	4	25	75	100
Learning Objectives											
CLO1	To familiarize students with concepts of managerial economics and its relevant concepts of economics in current business scenario										
CLO2	To understand the applications & implications of economics and its knowledge of the mechanics of supply and demand markets in decision-making and problem solving.										
CLO3	To Understand the optimal point of cost analysis and production factors of the firm										
CLO4	To describe the pricing methods and strategies that are consistent with evolving marketing needs										
CLO5	To Provide insights to the various market structures in an economy.										
UNIT	Details							No. of Hours	Learning Objectives		
I	Nature and scope of managerial economics – definition of economics – important concepts of economics – relationship between micro, macro and managerial economics – nature and scope – objectives of firm.							12	CLO1		
II	Demand analysis – Theory of consumer behavior – Marginal utility analysis – indifference curve analysis Meaning of demand – Law of demand – Types of demand-Determinants of demand – Elasticity of demand –Demand forecasting.							12	CLO2		
III	Production and cost analysis – Production – Factors of production – production function – Concept – Law of variable proportion – Law of return to scale and economics of scale – cost analysis – Different cost concepts – Cost output relationship short run and long run – Revenue curves of firms – Supply analysis.							12	CLO3		
IV	Pricing methods and strategies – Objectives – Factors – General consideration of pricing – methods of pricing – Dual pricing – Price discrimination							12	CLO4		
V	Market classification – Perfect competition – Monopoly – Monopolistic competition – Duopoly – Oligopoly							12	CLO5		
	Total							60			

Course Outcomes		
Course Outcomes	On completion of this course, students will;	Program Outcomes
CO1	Analyze & apply the various managerial economic concepts in individual & business decisions.	PO2, PO6, PO8
CO2	Explain demand concepts, underlying theories and identify demand forecasting techniques.	PO6, PO8
CO3	Employ production, cost and supply analysis for business decision making	PO1, PO2, PO6
CO4	Identify pricing strategies	PO1, PO2, PO6
CO5	Classify market structures under competitive scenarios.	PO2, PO6, PO8
Reading List		
1.	Journal of Economic Literature – American Economic Association	
2.	Arthasastra Indian Journal of Economics & Research	
3.	Mithani D.M. (2016) -Managerial Economics –Himalaya Publishing House – Mumbai	
4.	Indian Economic Journal/Sage Publications	
5.	Mehta P.L (2016) – Managerial Economics – Sultan Chand & Sons – New Delhi	
References Books		
1.	Dr. S. Sankaran; Managerial Economics; Margham Publication, Chennai, 2019	
2.	Thomas and Maurice; Managerial Economics: Foundations of Business Analysis and Strategy, McGraw Hill Education, 10 editions, 2017.	
3.	D N Dwivedi; Managerial Economics: Vikas Publishing House, 8 th edition, 2015.	
4.	H L Ahuja; Managerial Economics, S. Chand, 9th Edition, 2017.	
5.	Dominick Salvatore; Managerial Economics: Principles and Worldwide Applications, Oxford University Press, Eighth edition, 2016	
Web Resources		
1	https://www.studocu.com/row/document/azerbaycan-dovlet-iqtisad-universiteti/business-and-management/lecture-notes-on-managerial-economics/6061597	
2	https://www.intelligenteconomist.com/profit-maximization-rule	
3	http://www.economicdiscussion.net/laws-of-production/laws-of-production-laws-of-returns-to-scale-and-variable-proportions/5134	
4	http://www.simplynotes.in/e-notes/mbabba/managerial-economics/	
5	https://businessjargons.com/determinants-of-elasticity-of-demand.html	
Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminar	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
BBA DSC08	BUSINESS REGULATORY FRAME WORK	Elec tive	Y	-	-	-	3	4	25	75	100
Course Objectives											
CLO1	Explain Indian Contracts Act										
CLO2	Understand Sales of goods act& contract of agency										
CLO3	Understand Indian Companies Act 1956										
CLO4	Understand Consumer Protection Act – RTI										
CLO5	Understand Cyber law										
UNIT	Details							No. of Hours	Learning Objectives		
I	Brief outline of Indian Contracts Act - Special contracts Act							15	CLO1		
II	Sale of goods Act - Contract of Agency							15	CLO2		
III	Brief outline of Indian Companies Act 1956.- kinds-formation-MOA-AOA- Prospectus- Appointment of Directors- Duties-Meeting- Resolutions-Winding up -							15	CLO3		
IV	Consumer Protection Act – RTI							15	CLO4		
V	Brief outline of Cyberlaws – IT Act 2000 & 2008							15	CLO5		
								75			
Course Outcomes	On Completion of the course the students will							Program Outcomes			
CO1	Explain Indian Contracts Act							PO1,PO3,PO6,PO8			
CO2	Understand Sales of goods act and Contract of Agency							PO1,PO2,PO3,PO4, PO5,PO8			
CO3	Understand Indian Companies Act 1956							PO3,PO4,PO6,PO8			
CO4	Understand Consumer Protection Act – RTI							PO1,PO2,PO3,PO6, PO7,PO8			
CO5	Understand Cyber law							PO1,PO3,PO6,PO7, PO8			

Reading List		
1	Tulsian.P.C Business Law (2018) Third Edition, McGraw Hill Publications	
2	Pillai R S N, Bhagavati, Business Law, Third Edition, Sultan Chand	
3	N D Kapoor(2019), Elements of Merchantile Law, Sultan Chand & Sons	
4	Constitutional Law – Dr. M.R. Sreenivasan & Ananda Krishna Deshkulkarni	
5	Business Law (Commercial Law) – Dr. M.R. Sreenivasan	
References Books		
1	Business Regulatory Framework, Sahitya Bhawan Publications. Revised, 2022.	
2	Business Regulatory Framework, <u>Garg K.C., Sareen V.K., Sharma Mukesh, 2013</u>	
3	Business Regulatory Framework, Pearson Education India, 2011	
4	Bare Acts- RTI, Consumer Protection Act	
5	Business Regulatory Framework , Dr. Pawan Kumar Oberoi, Global Academic Publishers & Distributors, 2015	
Web Resources		
1	https://www.gkpad.com/sachin/06-22/bcom-Business-Regulatory-Framework---1.html	
2	http://www.simplynotes.in/e-notes/mcomb-com/business-regulatory-framework/	
3	https://www.studocu.com/in/course/mahatma-gandhi-university/business-regularly-framework/51661	
4	International Journal of Law (lawjournals.org)	
5	https://www.himpub.com/BookDetail.aspx?BookId=1936&NB=&Book_TitleM=%20Business%20Regulatory%20Framework	
Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	

Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	M	M	M	S	S	L	S
CO 2	S	M	M	M	S	S	L	S
CO 3	S	M	M	M	S	S	L	S
CO 4	S	M	M	M	S	S	L	S
CO 5	S	M	M	M	S	S	L	S

S-Strong M-Medium L-Low

**CO-PO Mapping with Programme Specific Outcomes (Course Articulation Matrix):
Level of Correlation between PSO's and CO's**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	3
CO 3	3	3	2	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Weightage	15	15	13	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	2.6	3.0	3.0

from all the three streams of education namely Commerce, Arts and Science. The BBA course offers knowledge and training in management and leadership skills to prepare them for managerial roles and entrepreneurship. During the tenure of the course, candidates learn various aspects of business administration and management through class room lectures, Games, Seminars and practical projects. The overall objectives of this academic Bachelor's program is to develop the students' intellectual capacity, executive personality, and managerial skills in a way that enables them assume entry-level managerial positions in business and industry, public sector organizations, consultancy companies and other organizations. Graduates of the program may also choose to start their own entrepreneurial business ventures

ELIGIBILITY FOR Any candidate who has passed the Plus Two of the Higher Secondary Board of Tamilnadu or that of any other university or Board of Examinations in any state recognized as equivalent to the Plus Two of the Higher Secondary Board in Tamilnadu.

DURATION OF THE COURSE The duration of the course shall be three academic years comprising **six semesters** into with two semesters for each academic year. There shall be at least 90 working days in a semester and a minimum 450 hours of instructions in a semester.

REGISTRATION Each student shall register for the courses in the prescribed registration form in consultation with the Faculty Advisor within two weeks from the commencement of each semester.

Revised Programme Structure (With effect from September 2022)

Sem (1)	Part I/ II/III/IV (2)	Subject number (3)	Subject Status(4)	Subject Title (5)	L	T	P	T	C	Maximum Marks		
										Internal	External	Total
I	I	1	Language	Tamil/other language				6	4	25	75	100
	II	2	Language	Communicative English -I				6	4	25	75	100
	III	3	Core-1	Professional English for Commerce and Management-I	3	0	2	5	4	25	75	100
	III	4	Core-2	Principles of Management	3	2	0	5	4	25	75	100
	III	5	Allied -1	Business Statistics	2	2	2	6	3	25	75	100
	IV	6	Common	Environmental Studies	2	0	0	2	2	25	75	100
Sub Total								30	21			
II	I	7	Language	Tamil / Other language				6	4	25	75	100
	II	8	Language	Communicative English -II				6	4	25	75	100
	III	9	Core-3	Professional English for Commerce and Management-II	3	0	2	5	4	25	75	100
	III	10	Core-4	Managerial Economics	3	2	0	5	4	25	75	100
	III	11	Allied-2	Business Mathematics	2	2	2	6	3	25	75	100
	IV	12	Common	Value Based Education / Mana VazharKalai	2	0	0	2	2	25	75	100
Sub Total								30	21			
III	I	13	Language	Tamil / Other language				6	4	25	75	100
	II	14	Language	Communicative English -III				6	4	25	75	100

	III	15	Core-5	Financial Accounting	4	0	0	4	4	25	75	100
	III	16	Core-6	Organizational Behaviour	4	0	0	4	4	25	75	100
	III	17	Allied-3	Business Law	2	2	0	4	3	25	75	100
	IV	18	Skill based <i>Practical - I</i>	Computer Applications in Business I	0	0	4	4	2	50	50	100
	V	19	Non-Major Elective-I	Advertising	2	0	0	2	2	25	75	100
		20	Common	Yoga	2	0	0	2	2	50	50	100
	Sub Total							30+2	25			
IV	I	21	Language	Tamil / Other language				6	4	25	75	100
	II	22	Language	Communicative English -IV				6	4	25	75	100
	III	23	Core-7	Cost Accounting	4	0	0	4	4	25	75	100
	III	24	Core-8	Marketing Management	4	0	0	4	4	25	75	100
	III	25	Allied-4	Human Resource Management	2	2	0	4	3	25	75	100
	IV	26	Skill based <i>Practical - II</i>	Computer Applications in Business II	0	0	4	4	2	50	50	100
	IV	27	Non-Major Elective-II	Consumer behavior	2	0	0	2	2	25	75	100
		28	Common	Computer for Digital Era	2	0	0	2	2	50	50	100
	V	29	Extension Activity	NSS/NCC/YRC/Physical Education	-	-	-	-	1	-	100	100
	Sub Total							30+2	26			
V	III	30	Core-9	Management Accounting	4	0	0	4	4	25	75	100
	III	31	Core-10	Research methodology	4	0	0	4	4	25	75	100
	III	32	Core-11	Production and Operations management	4	0	0	4	4	25	75	100
	III	33	Core-12	Banking and Insurance	4	0	0	4	4	25	75	100
	III	34	Major Elective -I	Retail Management/ Services Marketing	4	0	0	4	4	25	75	100
	IV	35	Major elective-II <i>(Practical)</i>	Effective Employability Skills-I	0	0	4	4	2	50	50	100
	IV	36	Skill based Subject Common	Personality Development	2	0	0	2	2	25	75	100
	III	37		Field Study	0	0	4	4	2	50	50	100
	Sub Total				22	0	8	30	26			
VI	III	38	Core-13	Financial management	4	0	0	4	4	25	75	100
	III	39	Core-14	Strategic Management	4	0	0	4	4	25	75	100
	III	40	Core-15	Entrepreneurship Development	4	0	0	4	4	25	75	100
	III	41	Major Elective-III	Training and Development/ Financial Services	4	0	0	4	4	25	75	100
	IV	42	Major elective- IV <i>(Practical)</i>	Effective Employability Skills- II	0	0	4	4	2	50	50	100
	III	43		Major Project	0	0	10	10	5	50	50	100
	Sub Total				16	0	14	10	23			

L-Lecture Hours T-Tutorial Hours P-PracticalHours T- Total hours / week C- Credit
Allocationofquestionsforproblemorientedsubjects:40%theoryand60%problems

MSU/2021-22/UG-Colleges/Part-III(B.B.A.)/Semester-III/Ppr.no.19/Non-Major-Elective-1
ADVERTISING

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- 1.To enable the students to study the evolution of advertising
- 2.To study the functions of advertising agencies
3. to explain the process of advertisement making and launching

COURSE OUTCOMES:

- CO 1: Understand the origin and growth of advertising sector
CO 2: Explain types of advertising
CO 3: describe about the functions of advertising agencies
CO 4: To identify and make decisions regarding the most feasible advertising appeal and media mix
CO 5: To conduct pre-testing and post testing of advertisement to determine their effectiveness

UNIT-I:INTRODUCTION TO ADVERTISING

Advertising – Meaning- Origin and Development- Objectives- Importance- Functions of advertising- Classification and Types of advertisements – merits and demerits

UNIT –II:ADVERTISING AGENCIES

Type and functions of advertising agencies-Advertisement campaign- Social, economic and legal aspects of advertisements - Misleading advertisements- Advertisement Standards council of India- Regulation of advertising in India

UNIT-III:DRAFTING ADVERTISEMENT COPY

Advertisement copy- Requisites of an effective advertisement copy-Types of copy- Elements of copy- Layout- functions of layout – Elements of layout – Principles of design and layout- Copy writing- Qualities of good Copy Writer-Copy testing and Advantages

UNIT–IV:ADVERTISING MEDIA

Media Planning and Strategy -Importance of media planning and selection- Problems in media planning- Internet as an advertisement medium-Objects of Internet advertisement – Advantages and disadvantages of internet advertising

UNIT-V:MEASURING THE EFFECTIVENESS OF ADVERTISING

Need and importance for measuring the effectiveness of advertising- Methods of Measurement: Pretesting, Concurrent testing, Post testing-DAGMAR Model

Text Books:

1. Manendra Mohan – Advertising Management – Concepts and Cases, Tata McGraw Hill
2. Sherlekar, Victor &Nirmala Prasad – Advertising Management – Himalaya Publishing House

REFERENCE BOOKS:

1. C.L. Tyagi, Arun Kumar- Advertising Management- Atlantic Publishers and Distributors
2. Wells, Moriarty & Burnett, Advertising, Principles & Practice, Pearson Education
3. Ruchi Gupta, Advertising – Scholar Tech Press
4. Rajeev Patra and John G. Myers, Advertising Management -Pearson India, New Delhi

WEB RESOURCES:

1. <https://www.slideshare.net>
2. <https://neilpatel.com>
3. <https://open.umn.edu>
4. <https://courses.lumenlearning.com>

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PO &PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	M	L	L	M	S	M	L	M	L
CO 2	M	S	L	S	M	S	M	M	L	L
CO3	S	M	M	L	S	S	S	M	M	L
CO4	S	M	L	L	M	S	S	L	M	L
CO5	S	M	M	L	L	S	M	M	L	L

S – Strong

M – Medium

L- Low

MSU/2021-221/UG-Colleges/Part-III(B.B.A.)/Semester-IV /Ppr.no.27/NME-II
CONSUMER BEHAVIOUR

L	T	P	C
2	0	0	2

Course objective:

1. To explain the elements constituting Human Behaviour and their relevance towards consumption and purchase
2. To describe the marketing programs and strategies while keeping in mind factors that may influence consumer behaviour
3. To identify consumer decision making models and trends.

COURSE OUTCOMES:

CO 1: understand concept of Consumer Behaviour, types of Consumers, Diversity of Consumers.

CO 2: Acquire basic knowledge about issues and dimensions of Consumer Behaviour.

CO 3: Analyzing consumer information and using it to create consumer oriented marketing strategies.

CO 4: Understand the formulation of marketing strategies based on consumer behaviour

CO 5: Describe the innovation diffusion process

UNIT- I: INTRODUCTION TO CONSUMER BEHAVIOUR

Nature, scope & application and Characteristics of consumer Behaviour– Importance of Consumer behaviour in marketing decisions.

UNIT- II: FACTORS AFFECTING CONSUMER BEHAVIOUR

External Influences – Culture, Sub Culture, Social Class, Reference Groups, Family - Internal Influences– Needs & Motivations, Perception, Personality, Lifestyle, Values, Learning, Memory, Beliefs & Attitudes.

UNIT -III: CONSUMER DECISION MAKING PROCESS

Types of consumer decisions, Consumer Decision Making Process - Problem Recognition - Information Search - Alternative Evaluation –Purchase Selection – Post purchase Evaluation, -Decision Making Models – Black Box Model - Economic model - Howard &Sheth model.

UNIT- IV: CONSUMER BEHAVIOR ANALYSIS AND MARKETING STRATEGY

Consumer Behaviour and Product Strategy - Consumer Behaviour and Pricing Strategy - Consumer Behaviour and Distribution Strategy - Consumer Behaviour and Promotion Strategy

UNIT- V:DIFFUSION OF INNOVATION

Definition of innovation, product characteristics, influencing diffusion, resistance to innovation, adoption process. Buying pattern in the new digital era.

TEXT BOOKS:

1. Hawkins, Best and Coney, Consumer Behaviour, Tata McGraw Hill, New Delhi
2. Leon G Shiffman& Leslie LazerKanuk, Consumer Behaviour –. Pearson Education publishers, Singapore

REFERENCE BOOKS:

1. John A Howard, Consumer Behaviour in Marketing Strategy, Prentice Hall New Delhi
2. Schiffman L G and Kanuk L L Consumer Behaviour, Prentice Hall New Delhi
3. Anita Ghatak, Consumer Behaviour in India, D K Agencies (P) Ltd New Delhi
4. Consumer Behaviour in Indian Perspective –Suja R. Nair, Himalaya Publishing House,

3. Dr. P. Periasamy: Principles and Practice of Insurance Himalaya Publishing House, Delhi.
4. Inderjit Singh, Rakesh Katyal & Sanjay Arora: Insurance Principles and Practices, Kalyani Publishers, Chennai.

Web Resources:

1. cbseacademic.nic.in
2. <https://ncfe.org.in>
3. <https://onlinejain.com>
4. <https://egov.uok.edu.in>

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	M	L	L	M	S	M	L	M	L
CO 2	M	S	L	S	M	S	M	M	L	L
CO3	S	M	M	L	S	S	S	M	M	L
CO4	S	M	L	L	M	S	S	L	M	L
CO5	S	M	M	L	L	S	M	M	L	L

S – Strong

M – Medium

L- Low

Course Objectives:

1. To give an overview of the conceptual aspects of retail marketing management.
2. to foster the development of the students critical and creative thinking skills
3. To prepare students for positions in the retail sector or positions in the retail divisions of consulting companies

COURSE OUTCOMES:

CO 1: Clarify the concept and related terms in retailing.

CO 2: Comprehend the ways retailers use marketing tools and techniques to interact with their customers.

CO 3: Understand various formats of retail in the industry.

CO 4: Recognize and understand the operations-oriented policies, methods, and procedures

CO 5: Understand how to create a shopping experience that builds customer

UNIT-I: Introduction

Retailing: - Introduction - scope - Functions of retailing - Retail industry in India - types of Retailing format – Segments of organized retailing in India- Retail as a career.

UNIT-II: Retail planning

Retail planning and location: - Introduction – Strategic retail planning process - Location - Types of locations – Steps – Site selection Analysis.

UNIT-III: Retail store Design and Pricing

Store design, layout and Visual merchandising: Concepts and principles – elements – Visual merchandising and atmospherics – tools used for visual merchandising - pricing.

UNIT-IV: Retail Supply Chain Management

Supply chain management and Retail logistics: - Evolution of supply chain management – Need CPFR – Retail logistics – concepts – Importance of information in supply chain management.

UNIT-V: Retail Promotion

Retail promotion: - Retail store sales promotion - Retail promotion mix strategy – Emerging trends in retailing – Online retailing.

TEXT BOOKS:

1. Michall Levy , Barton.A Weitz, Dhruv Grewal, Retailing management – Mc Graw Hill
2. Gibson G. Vedamani – Retail management – functional principles and Practice, Jaico Publishing House, New Delhi

REFERENCE BOOKS:

1. Swapna Pradhan, Retail Management, McGraw Hill Education
2. Harjit Singh: Retail Management, S. Chand Publication.
3. Chetan Bajaj , Nidhi.V Srinivasa and Rajneesh Tuli, Retail management – Oxford Higher Education
4. S.K. Baral, A Hand Book of Retail management- AITBS Publishers, India

WEB RESOURCES:

1. <https://classcentral.com>
2. <https://www.skillscommons.org>
3. <https://www.benzinga.com>
4. <https://www.mindluster.com>

MSU/2021-22/UG-Colleges/Part-III(B.B.A.)/Semester-V/Ppr.no.36/ Major Elective -II
EFFECTIVE EMPLOYABILITY SKILLS- 1
(Practical Subject)

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

1. To identify the knowledge and skills required for obtaining and keeping employment.
2. To emphasize individual skill assessments, interpersonal communication skills, workplace responsibilities, teamwork skills,
3. To impart the knowledge and skills for enhancing the career opportunities.

COURSE OUTCOMES

CO 1: To help students explore their values and career choices through individual skill assessments.

CO 2: To make realistic employment choices and to identify the steps necessary to achieve a goal.

CO 3: To explore and practice basic communication skills

CO 4: To learn skills for discussing and resolving problems on the work site

CO 5: To assess and improve personal grooming

UNIT- 1: ENGLISH

Spotting errors-Fill in the blank Cloze Test-Idioms & Phrases-Synonyms & Antonyms---
Rearranging the Sentence – One word substitution- Phrase substitution- jumbled sentences-
Double blank sentences- Commonly misspelled words - Comprehensions

UNIT-II:TEST OF REASONING –I

Symbols and their relationships- Arithmetical computation – Decision making- verbal and
figure classification- Analytical functions -Space visualization- Judgement- Problem Solving-
Discrimination

UNIT-III: TEST OF REASONING –II

Assigning Artificial Values to Arithmetical Series -Series Completion Test – Visual memory
– Observation – Arithmetical reasoning- Relationship concepts- Differences- Analysis_
Similarities-Analogies

UNIT -IV: QUANTITATIVE APTITUDE I

Number System:Decimals and Fractions- Whole numbers- Relationship between numbers-
Ratio & Proportion – HCF & LCM- Simplification – Profit & Loss –Time and Work-

UNIT-V: QUANTITATIVE APTITUDE II

Average ---Simple Interest---Compound Interest– Time and Distance – Permutations &
combinations- Probability- Data interpretation – Data sufficiency

Note: Examination Pattern:

- The Effective employability Skills IPaper is 100 marks (**50 Continuous Internal Assessment Marks + 50 End Semester PRACTICAL Examinations marks**).
- For Continuous **Internal Assessment Examination ONE** test is to be conducted with **50 MCOQs**.
- For **End Semester PRACTICAL Examinations**; **Seventy five multiple choice objective type questions** are to be asked. (with one correct and three incorrect alternatives and no deduction for wrong or un-attempted questions)
- The paper consists of five units. 15 MCOQs are to be asked from each unit.
- The question paper setter is requested to set the questions strictly according to the syllabus.

UNIT-IV:SERVICE DELIVERY AND PROMOTION

Positioning of services – Designing service delivery System, Service Channel – Pricing of services, methods–Service marketing triangle–
Managing demand, Managing supply, managing Demand and Supply of Service–
Integrated Service marketing communication.

(12 hrs)

UNIT-V:SERVICE STRATEGIES

Service Marketing Strategies for Health – Hospitality – Tourism – Financial – Logistics–
Educational – Marketing of Online Services– Entertainment & public utility
Information technique Services. (12hrs)

COURSE OUTCOMES:

CO 1: To appreciate the challenges faced by services marketing in comparison with the traditional commercial marketing, e-marketing and non commercial environments •

CO 2: To appreciate the differences between marketing physical products and intangible services, including dealing with the extended services marketing mix, and the four unique traits of services marketing;

CO 3: Recognise the challenges faced in services delivery as outlined in the services gap model.

TEXT BOOKS:

1. Lovelock, C.H , Service Marketing : Prentice Hall, London
2. Jha S.M, Service Marketing : Himalaya Publishing House, New Delhi.
3. R. Srinivasan , Service Marketing : The Indian Context, third edition, (PHI).

WEB RESOURCES:

1. [https:// www.mooc-list.com](https://www.mooc-list.com)
2. <https://onlinecourses.nptel.ac.in>
3. <https://ebs.online.hw.ac.uk>
4. <https://www.classcentral.com>

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	M	L	L	M	S	M	L	M	L
CO 2	M	S	L	S	M	S	M	M	L	L
CO3	S	M	M	L	S	S	S	M	M	L
CO4	S	M	L	L	M	S	S	L	M	L
CO5	S	M	M	L	L	S	M	M	L	L

S – Strong

M – Medium

L- Low

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI -12

COMMON SKILL BASED SUBJECT FOR U.G. PROGRAMME

Personality Development

UNIT -I

PERSONALITY - Definition – Determinants – Personality Traits –Theories of Personality – Importance of Personality Development. **SELF AWARENESS** – Meaning – Benefits of Self – Awareness – Developing Self – Awareness. **SWOT** – Meaning – Importance- Application – Components. **GOAL SETTING** Meaning- Importance – Effective goal setting – Principles of goal setting – Goal setting at the Right level.

UNIT – II

SELF MONITORING – Meaning – High self – monitor versus low self monitor – Advantages and Disadvantages self monitor- Self –monitoring and job performance. **PERCEPTION**- Definition- Factor influencing perception- Perception process –Errors in perception – Avoiding perceptual errors. **ATTITUDE** – Meaning- Formation of attitude – Types of attitude - Measurement of Attitudes – Barriers to attitude change – Methods to attitude change. **ASSERTIVENESS** - Meaning – Assertiveness in Communication – Assertiveness Techniques – Benefits of being Assertive – Improving Assertiveness.

UNIT – III

TEAM BUILDING – Meaning – Types of teams – Importance of Team building- Creating Effective Team. **LEADERSHIP** – Definition – Leadership style- Theories of leadership – Qualities of an Effect leader. **NEGOTIATION SKILLS** – Meaning – Principles of Negotiation – Types of Negotiation – The Negotiation Process – Common mistakes in Negotiation process. **CONFLICT MANAGEMENT** – Definition- Types of Conflict- Levels of Conflict – Conflict Resolution – Conflict management .

UNIT –IV

COMMUNICATION – Definition – Importance of communication – Process of communication - Communication Symbols – Communication network – Barriers in communication – Overcoming Communication Barriers. **TRANSACTIONAL ANALYSIS** – Meaning – EGO States – Types of Transactions – Johari Window- Life Positions. **EMOTIONAL INTELLIGENCE**- Meaning – Components of Emotional Intelligence- Significance of managing Emotional intelligence – How to develop Emotional Quotient. **STRESS MANAGEMENT** – Meaning – Sources of Stress – Symptoms of Stress – Consequences of Stress – Managing Stress

UNIT – V

SOCIAL GRACES – Meaning – Social Grace at Work – Acquiring Social Graces. **TABLE MANNERS** – Meaning – Table Etiquettes in Multicultural Environment- Do's and Don'ts of Table Etiquettes. **DRESS CODE** – Meaning- Dress Code for selected Occasions – Dress Code for an Interview. **GROUP DISCUSSION** – Meaning – Personality traits required for Group Discussion- Process of Group Discussion- Group Discussion Topics. **INTERVIEW** – Definition- Types of skills – Employer Expectations –Planning for the Interview – Interview Questions- Critical Interview Questions.

References :

1. Dr.S. Narayana Rajan, Dr. B. Rajasekaran, G. Venkadasalaphi, V. Vijuresh Nayaham and Herald M.Dhas, **Personality Development**, Publication Division, Manonmaniam Sundaranar University, Tirunelveli
2. Stephan P.Robbins, **Organisational Behaviour**, Tenth Edition, Prentice Hall of India Private Limited, New Delhi,2008
3. Jit S. Chandan, **Oragnisational Behaviour**, Third Edition, Vikas Publishing House Private Limited, 2008
4. Dr.K.K. Ramachandran and Dr.K.K. Karthick, **From Campus to Corporate**, Macmillan Publishers India Limited, New Delhi,2010.

MSU/2021-221/UG-Colleges/Part-III(B.B.A.)/Semester-VI/Ppr.no.41/MajorElective-III
TRAINING AND DEVELOPMENT

L	T	P	C
4	0	0	4

Course Objectives: To understand the concepts, tools and techniques of management training and development.

COURSE OUTCOMES:

CO1: To develop an understanding of the evolution of training & development from a tactical to a strategic function.

CO2: To provide an insight into what motivates adults to learn and the most appropriate methodologies to impart training

CO3: To understand the concept of training audit & training evaluation

CO4: To learn how design a training module and execute it

CO5: To understand the need for and concept of Performance Management

UNIT-I: LEARNING

Concept, principles of learning, methods of learning, importance of teaching techniques, instructional technology, instructor behaviour, attention versus involvement.

UNIT-II: TRAINING

Training: Concept, Importance & Objectives of Training, Process and Significance of Training, Identification of Training Needs, Evaluation of Training Effectiveness.

UNIT-III: METHODS OF TRAINING

On the job training, Off the job training, choosing optimum method, the lecture, field trips, panel discussion, behavior modeling, interactive demonstrations, brain storming, case studies, action mazes, incident process, in-baskets, team tasks, buzz-groups and syndicates, agenda setting, role-plays-reverse role plays, rotational role plays, finding metaphors, simulations, business games, clinics, critical incidents, fish bowls, T-groups, data gathering, grouping methods, transactional analysis, exception analysis.

UNIT-

IV: DESIGNING AND CONDUCTING TRAINING AND DEVELOPMENT PROGRAMMES

Concept - process of designing and conducting Training and development. Designing A Training Unit (Cross Cultural, Leadership, Training the Trainer, Change), Budgeting of Training.

UNIT-V: EVALUATION OF TRAINING AND DEVELOPMENT PROGRAMME

Concept-Definition of Training Evaluation-Types of Evaluation-Evaluation design issues, Induction versus Orientation – Evaluating Training and development-objectives, process, purpose, Effectiveness of training.

TEXT BOOKS:

1. Lynton R Pareek, U, Training for Development, Vistaar, New Delhi.
2. Peppar, Allan D, Managing the Training and Development Function, Gower, Aldershot
3. Buckley, R., & Caple, J The theory and practice of Training (5th ed.) London and Sterling,

WEB RESOURCES:

1. <https://inflibnet.ac.in>
2. <https://onlinecourses.nptel.ac.in>
3. <https://nsdcindia.org>
4. <https://managementhelp.org>

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	M	L	L	M	S	M	L	M	L
CO 2	M	S	L	S	M	S	M	M	L	L
CO3	S	M	M	L	S	S	S	M	M	L
CO4	S	M	L	L	M	S	S	L	M	L
CO5	S	M	M	L	L	S	M	M	L	L

S – Strong

M – Medium

L- Low

L	T	P	C
4	0	0	4

Course Objectives:

1. To familiarize the students with the financial services industry as the growing phenomenon of Liberalization, Privatizations and Globalizations.
2. To impart knowledge about Indian financial system and Indian financial market and its assets.
3. To develop knowledge about new and innovative financial services introduced in recent years.

COURSE OUTCOMES:

CO 1: Understand the functioning of the financial system & Financial services

CO 2 Apply critical, analytical and integrative thinking while understanding the functioning for the Leasing

CO 3: Utilise factoring, forfaiting and leasing services for their enterprises.

CO 4:. Assess and make wise investments in mutual funds and also get their credit worthiness evaluated for obtaining borrowings/investments.

CO 5: Develop a critical, analytical and integrative thinking of the role played by the regulators in the smooth functioning of the markets.

UNIT-1:INTRODUCTION

FinancialServices–meaning and types–Fund based financial services and fee based financial services–Introduction to Merchant Banking Services in India–Role and functions of Merchant Bankers.

UNIT–II:VENTURE CAPITAL AND MUTUAL FUNDS

Features and types of Venture Capital – Various stages of Venture Capital €Financing - Venture Capital Exit Strategies – Venture capital firms in India – Mutual Funds – Types-structure- NAV- Mutual funds in India

UNIT–III:LEASING AND FACTORING

Leasing essentials - Operating and Financial Lease – Advantages and Limitations of Leasing – Leasing Vs hire purchase -Factoring – Parties involved and process of factoring-Functions of a Factor -Different forms of factoring services - Factoring Vs Bills discounting – Forfaiting-Mechanism of Forfaiting – Factoring VS Forfaiting.

UNIT-IV:CREDIT RATING

Meaning, types of credit Rating and Need for credit rating- Factors affecting credit Rating- Advantages and Limitations of credit rating- Rating Process and methodology - Credit Rating Agencies in India.

UNIT- V: MERGERSANDACQUISITIONS

Expansion of business firms- Internal and External expansion. Forms of combinations merger, acquisition and takeover-Reasons for merger -Types of merger-Merger VS Take over -Types of Takeover –Defense strategy against hostile takeover Mergers in India – Recent trends in financial services – Shadow banking-Angel funds- hedge funds.

TextBooks:

1. Bhole, L.M., Financial Institutions and Markets: Structure, Growth and Innovations Tata Mc-Grow Hill. New Delhi:
2. Khan, M.Y., Financial Services – Tata McGraw Hill New Delhi.
3. Gurusamy.S., Merchant Banking and Financial Services, McGraw Hill Educations India
4. VA Avadhani, Financial Services in India, Himalaya Publishing House, Mumbai

WEB RESOURCES:

1. <https://www.glbimr.org>
2. <https://due.com>
3. <https://www.cipfa.org>
4. <https://corporatefinanceinstitute.com>

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	M	L	L	M	S	M	L	M	L
CO 2	M	S	L	S	M	S	M	M	L	L
CO3	S	M	M	L	S	S	S	M	M	L
CO4	S	M	L	L	M	S	S	L	M	L
CO5	S	M	M	L	L	S	M	M	L	L

S – Strong

M – Medium

L- Low

EFFECTIVE EMPLOYABILITY SKILLS- II

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

1. To identify the knowledge and skills required for obtaining and keeping employment.
2. To emphasize individual skill assessments, interpersonal communication skills, workplace responsibilities, teamwork skills,
3. To impart the knowledge and skills for enhancing the career opportunities.

COURSE OUTCOMES

CO 1: To help students explore their values and career choices through individual skill assessments

CO 2: To make realistic employment choices and to identify the steps necessary to achieve a goal

CO 3: To explore and practice basic communication skills

CO 4: To learn skills for discussing and resolving problems on the work site

CO 5: To assess and improve personal grooming

UNIT -I: GENERAL AWARENESS- I

India and its neighboring countries especially pertaining to History, culture, geographic, economic Scene, General Policy & Scientific Research- Government schemes and policies – Banking and Insurance awareness – Financial awareness

UNIT-II: GENERAL AWARENESS- II

Current affairs — Books and Authors – Sports - Important days in a year – Abbreviations- Portfolio – People in news

UNIT-III: Numerical ability -III

UNIT – IV:COMPUTER PROFICIENCY TEST -II

Computer Fundamentals – Computer Hardware- Computer software- Memory- Key board shortcuts- Computer Abbreviations- Microsoft Office – Networking –Internet.

UNIT -V: INTERVIEW SKILLS

Resume writing – Meaning – Features of a good resume, Model (Exercise) . Key Skills to attend the Interview, Answering interview Questions, Handling Tricks situations.

Note: Examination Pattern:

- The Effective employability Skills II Paper is 100 marks (25 Continuous Internal Assessment Marks + 75 End Semester External University Examinations marks).
- For Continuous Internal Assessment Examinations: three tests are to be conducted with 25 MCOQs. The best two test marks are considered for awarding internal marks.
- For External University Examinations, Seventy five multiple choice questions are to be asked. (with one correct and three incorrect alternatives and no deduction for wrong or un-attempted questions)
- The paper consists of five units. 15 MCOQs are to be asked from each unit.
- The question paper setter is requested to set the questions strictly according to the syllabus.

Text Books:

1. Dr.Lal&Jain,Upkar’s Mental Ability Test --- ,UpkarPrakasan Publications Pvt Ltd – Agra.
2. Dr.Lal&A.K.Singh Quicker Reasoning Test--- -UpkarPrakasan Publications Pvt Ltd –Agra. V.P.Mishra-Objective Arithmetic, New light Publishers,Newdelhi.
3. Dr.K.Alex ,Soft Skills

E-RESOURCES:

1. www.bankersadda.com
2. www.gktoday.comwww.jagranjosh.com/bankexams/bank_recruitment-study_material
3. www.affairscloud.com/studymaterial-pdf-download/

MAPPING-COURSE OUTCOME WITH PROGRAMME SPECIFIC OUTCOME

CO/PO & PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	M	L	L	M	S	M	L	M	L
CO 2	M	S	L	S	M	S	M	M	L	L
CO3	S	M	M	L	S	S	S	M	M	L
CO4	S	M	L	L	M	S	S	L	M	L
CO5	S	M	M	L	L	S	M	M	L	L

S – Strong

M – Medium

L- Low

MSU/2021-22/UG-Colleges/Part-III(B.B.A.)/Semester-V/Ppr.no.37/

FIELD STUDY

L	T	P	C
0	0	2	2

CourseObjectives:

➤ To

undergo



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TIRUNELVELI - 12**

B.COM

SYLLABUS

**(With effect from the Academic Year
2023-2024 onwards)**

Part	Course Code	Title of the Course	Credits	Hours
FIRST YEAR				
FIRST SEMESTER				
Part I		Language–Tamil	3	6
Part II		English	3	6
Part III		Core Paper I– Financial Accounting I	5	5
Part III		Core Paper II– Principles of Management	5	5
Part III	Any one	Elective I–Business Communication Elective I–Indian Economic Development Elective I–Business Economics	3	4
Part IV	Skill Enhancement Course SEC –1	(select any One) Digital Banking / MS Office	2	2
	Foundation Course FC	Fundamentals of Business Studies	2	2
		TOTAL	23	30
SECOND SEMESTER				
Part I		Language–Tamil	3	6
Part II		English	3	6
Part III		Core Paper III – Financial Accounting II	5	5
Part III		Core Paper IV– Business Law	5	5
Part III	Any one	Elective II–Business Environment Elective II –Insurance and Risk Management Elective II–International Trade	3	4
Part IV	Skill Enhancement Course SEC– 2	(Select any Two) Internet and its Applications/ Stock Market Operation/ New venture Planning and Development	2	2
	Skill Enhancement Course SEC– 3		2	2
		TOTAL	23	30

FIRST YEAR – SEMESTER - I

ELECTIVE - I: INDIAN ECONOMIC DEVELOPMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4				3	4	25	75	100
Learning Objectives									
LO1	To understand the concepts of Economic growth and development								
LO2	To know the features and factors affecting economic development								
LO3	To gain understanding about the calculation of national income								
LO4	To examine the role of public finance in economic development								
LO5	To understand the causes of inflation								
Prerequisites: Should have studied Commerce in XII Std									
Unit	Contents								No. of Hours
I	Economic Development and Growth Meaning & Definition - Concepts of Economic Growth and Development. Differences between Growth and Development. Measurement of Economic Development: Per Capita Income, Basic Needs, Physical Quality of Life Index, Human Development Index and Gender Empowerment Measure- Factors affecting Economic Development								12
II	Classification of Nations on the basis of development Characteristics of Developing Countries and Developed Countries - Population and Economic Development- Theories of Demographic Transition. Human Resource Development and Economic Development								12
III	National Income Meaning, Importance, National Income -Concept, types of measurement, Comparison of National Income at Constant and Current Prices. Sectorial Contribution to National Income. National Income and Economic Welfare								12
IV	Public Finance Meaning, Importance, Role of Public Finance in Economic Development, Public Revenue-Sources, Direct and Indirect taxes, Impact and Incidence of Taxation, Public Expenditure-Classification and Cannons of Public Expenditure, Public Debt-Need, Sources and Importance, Budget-Importance, Types of Deficits -Revenue, Budgetary, Primary and Fiscal, Deficit Financing.								12
V	Money Supply Theories of Money and Its Supply, Types of Money-Broad, Narrow and High Power, Concepts of M1, M2 and M3. Inflation and Deflation -Types, Causes and Impact, - Price Index- CPI and WPI, Role of Fiscal Policy in Controlling Money supply								12
TOTAL									60

Course Outcomes	
CO1	Elaborate the role of State and Market in Economic Development
CO2	Explain the Sectorial contribution to National Income
CO3	Illustrate and Compare National Income at constant and current prices.
CO4	Describe the canons of public expenditure
CO5	Understand the theories of money and supply
Textbooks	
1	Dutt and Sundaram, Indian Economy, S.Chand, New Delhi
2	V.K. Puri, S.K. Mishra, Indian Economy, Himalaya Publishing house, Mumbai
3	Remesh Singh, Indian Economy, McGraw Hill, Noida.
4	Nitin Singhania, Indian Economy, McGraw Hill, Noida.
5	Sanjeverma, The Indian Economy, unique publication, Shimla.
Reference Books	
1	GhatakSubrata : Introduction to Development Economics, Routledge Publications, New Delhi.
2	SukumoyChakravarty : Development Planning- Indian Experience, OUP, New Delhi.
3	Ramesh Singh, Indian Economy, McGraw Hill, Noida.
4	Mier, Gerald, M : Leading issues in Economic Development, OUP, New Delhi.
5	Todaro, MichealP : Economic Development in the third world, Orient Longman, Hyderabad
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1	http://www.jstor.org
2	http://www.indiastat.com
3	http://www.epw.in

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	2	3	2	2	2	2	2	2	2
CO2	3	2	3	3	2	2	2	2	2	3	2
CO3	3	2	3	3	2	2	2	2	2	2	2
CO4	3	2	3	3	2	2	2	2	2	2	2
CO5	3	2	3	3	2	2	2	2	2	2	2
TOTAL	15	10	14	15	10	10	10	10	10	13	10
AVERAGE	3	2	2.8	3	2	2	2	2	2	2.2	2

3 – Strong, 2- Medium, 1- Low

FIRST YEAR – SEMESTER – I

ELECTIVE - I: BUSINESS ECONOMICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4				3	4	25	75	100
Learning Objectives									
LO1	To understand the approaches to economic analysis								
LO2	To know the various determinants of demand								
LO3	To gain knowledge on concept and features of consumer behaviour								
LO4	To learn the laws of variable proportions								
LO5	To enable the students to understand the objectives and importance of pricing policy								
Prerequisites: Should have studied Commerce in XII Std									
Unit	Contents								No. of Hours
I	Introduction to Economics Introduction to Economics – Wealth, Welfare and Scarcity Views on Economics – Positive and Normative Economics - Definition – Scope and Importance of Business Economics - Concepts: Production Possibility frontiers – Opportunity Cost – Accounting Profit and Economic Profit – Incremental and Marginal Concepts – Time and Discounting Principles – Concept of Efficiency- Business Cycle:- Theory, Inflation, Depression, Recession, Recovery, Reflation and Deflation,								12
II	Demand & Supply Functions Meaning of Demand - Demand Analysis: Demand Determinants, Law of Demand and its Exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance. Demand Forecasting - Factors Governing Demand Forecasting - Methods of Demand Forecasting, Law of Supply and Determinants.								12
III	Consumer Behaviour Consumer Behaviour – Meaning, Concepts and Features – Law of Diminishing Marginal Utility – Equi-Marginal Utility – Cardinal and Ordinal concepts of Utility - Indifference Curve: Meaning, Definition, Assumptions, Significance and Properties – Consumer’s Equilibrium. Price, Income and Substitution Effects. Types of Goods: Normal, Inferior and Giffen Goods - Derivation of Individual Demand Curve and Market Demand Curve with the help of Indifference Curve.								12
IV	Theory of Production Concept of Production - Production Functions: Linear and Non – Linear Homogeneous Production Functions - Law of Variable Proportion – Laws of Returns to Scale - Difference between Laws of variable proportion and returns to scale – Economies of Scale – Internal and External Economies – Internal and External Diseconomies - Producer’s equilibrium								12

V	Market Structure Price and Output Determination under Perfect Competition, Short Period and Long Period Price Determination, Objectives of Pricing Policy, its importance, Pricing Methods and Objectives – Price Determination under Monopoly, kinds of Monopoly, Price Discrimination, Determination of Price in Monopoly – Monopolistic Competition – Price Discrimination, Equilibrium of Firm in Monopolistic Competition–Oligopoly – Meaning – features, “Kinked Demand” Curve	12
TOTAL		60
Course Outcomes		
CO1	Explain the positive and negative approaches in economic analysis	
CO2	Understood the factors of demand forecasting	
CO3	Know the assumptions and significance of indifference curve	
CO4	Outline the internal and external economies of scale	
CO5	Relate and apply the various methods of pricing	
Textbooks		
1	H.L. Ahuja, Business Economics–Micro & Macro - Sultan Chand & Sons, New Delhi.	
2	C.M. Chaudhary, Business Economics-RBSA Publishers - Jaipur-03.	
3	Aryamala.T, Business Economics, Vijay Nocole, Chennai.	
4	T.P Jain, Business Economics, Global Publication Pvt. Ltd, Chennai.	
5	D.M. Mithani, Business Economics, Himalaya Publishing House, Mumbai.	
Reference Books		
1	S.Shankaran, Business Economics-Margham Publications, Chennai.	
2	P.L.Mehta, Managerial Economics–Analysis, Problems & Cases, Sultan Chand & Sons, New Delhi.	
3	Peter Mitchelson and Andrew Mann, Economics for Business-Thomas Nelson Australia	
4	Ram singh and Vinaykumar, Business Economics, Thakur Publication Pvt. Ltd, Chennai.	
5	Saluram and Priyanka Jindal, Business Economics, CA Foundation Study material, Chennai.	
NOTE: Latest Edition of Textbooks May be Used		
Web Resources		
1	https://youtube.com/channel/UC69_-P77nf5-rKrjcpVEsqQ	
2	https://www.icsi.edu/	
3	https://www.yourarticlelibrary.com/marketing/pricing/product-pricing-objectives-basis-and-factors/74160	

FIRST YEAR – SEMESTER – II

ELECTIVE– II: BUSINESS ENVIRONMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks			
							CIA	External	Total	
	4				3	4	25	75	100	
Learning Objectives										
LO1	To understand the nexus between environment and business.									
LO2	To know the Political Environment in which the businesses operate.									
LO3	To gain an insight into Social and Cultural Environment.									
LO4	To familiarize the concepts of an Economic Environment.									
LO5	To learn the trends in Global Environment / Technological Environment									
Prerequisites: Should have studied Commerce in XII Std										
Unit	Contents								No. of Hours	
I	An Introduction The Concept of Business Environment - Its Nature and Significance –Elements of Environment- Brief Overview of Political – Cultural – Legal – Economic and Social Environments and their Impact on Business and Strategic Decisions.								12	
II	Political Environment Political Environment – Government and Business Relationship in India – Provisions of Indian Constitution Pertaining to Business.								12	
III	Social and Cultural Environment Social and Cultural Environment – Impact of Foreign Culture on Business – Cultural Heritage - Social Groups - Linguistic and Religious Groups – Types of Social Organization – Relationship between Society and Business - Social Responsibilities of Business.								12	
IV	Economic Environment Economic Environment – Significance and Elements of Economic Environment - Economic Systems and their Impact of Business – Macro Economic Parameters like GDP - Growth Rate of Population – Urbanization - Fiscal Deficit – Plan Investment – Per Capita Income and their Impact on Business Decisions.								12	
V	Technological Environment Technological Environment – Concept - Meaning - Features of Technology-Sources of Technology Dynamics - Transfer of Technology- Impact of Technology on Business - Status of Technology in India- Determinants of Technological Environment.								12	
TOTAL								60		
Course Outcomes										
CO1	Remember the nexus between environment and business.									
CO2	Apply the knowledge of Political Environment in which the businesses operate.									
CO3	Analyze the various aspects of Social and Cultural Environment.									
CO4	Evaluate the parameters in Economic Environment.									

CO5	Create a conducive Technological Environment for business to operate globally.
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Textbooks	
1	C. B. Gupta, Business Environment, Sultan Chand & Sons, New Delhi
2	Francis Cherunilam, Business Environment, Himalaya Publishing House, Mumbai
3.	Dr. V.C. Sinha, Business Environment, SBPD Publishing House, UP.
4.	Aswathappa.K, Essentials Of Business Environment, Himalaya Publishing House, Mumbai
5.	Rosy Joshi, Sangam Kapoor & Priya Mahajan, Business Environment, Kalyani Publications, New Delhi
Reference Books	
1.	Veenakeshavpailwar, Business Environment, PHI Learning Pvt Ltd, New Delhi
2.	Shaikhsaleem, Business Environment, Pearson, New Delhi
3.	S. Sankaran, Business Environment, Margham Publications, Chennai
4.	Namitha Gopal, Business Environment, Vijay Nicole Imprints Ltd., Chennai
5.	Ian Worthington, Chris Britton, Ed Thompson, The Business Environment, F T Prentice Hall, New Jersey
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1	www.mbaofficial.com
2	www.yourarticlelibrary.com
3	www.businesscasestudies.co.uk

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	3	3	3	2	2	3	2	3	3
CO2	3	2	2	3	3	2	3	3	2	3	3
CO3	3	2	3	3	3	2	3	3	2	3	3
CO4	3	2	3	3	3	2	2	3	2	3	3
CO5	3	2	3	3	3	2	3	3	3	3	3
TOTAL	15	10	14	15	15	10	13	15	11	15	15
AVERAGE	3	2	2.8	3	3	2	2.6	3	2.2	3	3

3 – Strong, 2- Medium, 1- Low

FIRST YEAR – SEMESTER - II
ELECTIVE - II: INSURANCE AND RISK MANAGEMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4				3	4	25	75	100
Learning Objectives									
LO1	To know the concepts and principles of contract of insurance								
LO2	To understand the basic concepts of life insurance								
LO3	To gain knowledge on the principles of general insurance								
LO4	To examine the Insurance Regulatory and Development Authority 1999 (IRDA)								
LO5	To know the risk management process								
Prerequisites: Should have studied Commerce in XII Std									
Unit	Contents								No. of Hours
I	Introduction to Insurance Definition of Insurance - Characteristics of Insurance – Principles of Contract of Insurance – General Concepts of Insurance – Insurance and Hedging – Types of Insurance – Insurance Intermediaries – Role of Insurance in Economic Development.								12
II	Life Insurance Life Insurance Business - Fundamental Principles of Life Insurance – Basic Features of Life Insurance Contracts - Life Insurance Products – Traditional and Unit Linked Policies – Individual and Group Policies - With and Without Profit Policies – Types of Life Insurance Policies – Pension and Annuities – Reinsurance – Double Insurance								12
III	General Insurance General Insurance Business - Fundamental Principles of General Insurance – Types - Fire Insurance – Marine Insurance – Motor Insurance – Personal Accident Insurance – Liability Insurance – Miscellaneous Insurance – Claims Settlement.								12
IV	Risk Management Risk Management – Objectives – Process – Identification and Evaluation of Potential Losses – Risk Reduction - Risk Transfer – Risk Financing - Level of Risk Management – Corporate Risk Management – Personal Risk Management.								12
V	IRDA Act 1999 Insurance Regulatory and Development Authority (IRDA) 1999 – Introduction – Purpose, Duties, Powers and Functions of IRDA – Operations of IRDA – Insurance Policyholders’ Protection under IRDA – Exposure/Prudential Norms - Summary Provisions of related Acts.								12
TOTAL								60	
Course Outcomes									
CO1	Identify the workings of insurance and hedging								
CO2	Evaluate the types of insurance policies and settlement								
CO3	Settle claims under various types of general insurance								

CO4	Know the protection provided for insurance policy holders under IRDA
CO5	Evaluate the assessment and retention of risk
Textbooks	
1	Neeti Gupta, Anuj Gupta and Abha Chopra, Risk Management and Insurance, Kalyani Publishers, New Delhi.
2	Dr.N. Premavathy – Elements of Insurance, Sri Vishnu Publications, Chennai.
3	M.N. Mishra & S.B. Mishra, Insurance Principles and Practice, S Chand Publishers, New Delhi.
4	Michel Crouhy, The Essentials of Risk Management, McGraw Hill, Noida.
5	Thomas Coleman, A Practical Guide to Risk Management, CFA, India.
Reference Books	
1	John C.Hull, Risk Management and Financial Institutions (Wiley Finance), Johnwiley & sons, New Jersey.
2	P.K. Gupta, Insurance and Risk Management, Himalaya Publications, Mumbai.
3	Dr. Sunilkumar, Insurance and Risk Management, Golgotia publishers, New Delhi.
4	Nalini PravaTripathy, Prabir Paal, Insurance Theory & Practice, Prentice Hall of India.
5	Anand Ganguly – Insurance Management, New Age International Publishers.
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1	https://www.mcminnlaw.com/principles-of-insurance-contracts/
2	https://www.investopedia.com/terms/l/lifeinsurance.asp
3	https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo108&flag=1

**MAPPING WITH PROGRAMME OUTCOMES
AND PROGRAMME SPECIFIC OUTCOMES**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	2	2	2	2	2
CO2	3	2	3	2	2	2	2	2	2	2	2
CO3	3	2	3	2	2	2	2	2	2	2	2
CO4	3	2	3	2	2	2	2	2	2	2	2
CO5	3	2	3	2	2	2	2	2	2	2	2
TOTAL	15	10	15	10	10	10	10	10	10	10	10
AVERAGE	3	2	3	2	2	2	2	2	2	2	2

3 – Strong, 2- Medium, 1- Low

FIRST YEAR – SEMESTER – II

ELECTIVE - II: INTERNATIONAL TRADE

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks			
							CIA	External	Total	
	4				3	4	25	75	100	
Learning Objectives										
LO1	To enable students familiarise with the basics of International Trade.									
LO2	To know the various theories of international trade.									
LO3	To impart knowledge about balance of trades and exchange rates.									
LO4	To gain knowledge about international institutions.									
LO5	To gain insights on World Trade Organisation									
Prerequisite: Should have studied Commerce in XII Std										
Unit	Contents								No. of Hours	
I	Introduction to International Trade – Meaning – Definition - Difference between Internal and International Trade – Importance of International Trade in the Global context								12	
II	Theories of International trade: Classical theories - Adam smith’s theory of Absolute Advantage – Ricardo’s Comparative cost theory - Modern theories of International Trade - Haberler’s Opportunity Cost theory – Heckscher –Ohlin’s Modern theory – International trade and Factor Mobility Theory – Leontiff’s Paradox - International trade and economic growth theory - Immiserating growth theory.								12	
III	Balance of Payments – Components of Balance of Payments - Current account, Capital account & Official settlement accounts - Disequilibrium in BOP -Methods of correcting Disequilibrium - Balance of Payment adjustment Theories - Marshall Lerner mechanism. Balance of Trade – Terms of Trade – Meaning – Definition – Difference between BOP and BOT.								12	
IV	International Economic Institutions - International Monetary System - Bretton Woods Conference – IMF - Objectives, Organizational structure – Membership – Quotas – Borrowing and Lending Programme of IMF – SDRs – India and IMF -World Bank and UNCTAD.								12	
V	World Trade Organisation (WTO) – Functions and Objectives – Agricultural Agreements – GATS - TRIPS – TRIMS.								12	
TOTAL								60		
Course Outcomes										
CO1	Distinguish between the concept of internal and international trade.									
CO2	Define the various theories of international trade.									

CO3	Examine the balance of trade and exchange rates
CO4	Appraise the role of IMF and IBRD.
CO5	Define the workings of WTO and with special reference to India.
Textbooks	
1	Francis Cherunilam, International Trade and Export Management – Himalaya Publishing House - Mumbai –04.
2	Paul.R.Krugman and Maurice Obstfeld, International Economics (Theory and Policy) - Pearson Education Asia - Addison Wesley Longman (P) Ltd. - Delhi – 92.
3	Robert J.Carbaugh, International Economics - Thomson Information Publishing Group - Wadsworth Publishing Company -California.
4	H.G. Mannur, International Economics – Vikas Publishing House (P) Ltd – New Delhi-14.
5	BimalJaiswal&Richa Banerjee, Introduction To International Business, Himalaya Publication, Mumbai
Reference Books	
1	Dr. T. Aryamala,Vijay Nicole, International Trade, Chennai
2	Avadhani, V.A. International Financial Management, Himalaya Publications, Mumbai
3	Punam Agarwal and Jatinder Kaur, International Business, Kalyani Publications, New Delhi
4	S Sankaran , International Trade, Margham Publication, Chennai
5	C B Gupta, International Business, S Chand Publishing, New Delhi
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1	https://opentext.wsu.edu/cpim/chapter/2-1-international-trade/
2	https://www.economicdiscussion.net/balance-of-payment/balance-of-payments-international-trade-economics/30644
3	https://www.wto.org/english/thewto_e/countries_e/india_e.htm

Manonmaniam Sundaranar University
Tirunelveli
Choice Based Credit System
Course Structure for B.Com – Affiliated Colleges
(With effect from the Academic Year 2021-2022 onwards)
II B.Com Semester - III

Semester	Part I/II/ III/ IV/V	Subject No.	Subject Status	Subject Title	Contact Hours Per week	Credit
	III	15	Language	Tamil-III/Other Language	6	4
	III	16	Language	English-III	6	4
	III	17	Major Core 5	Advanced Financial Accounting	5	4
	III	18	Major Core 6	Banking Theory Law & Practice	4	4
	III	19	Allied- III	Computer Applications in Business	3	3
III	IV	20	Non Major Elective I (Any one)	1. Introduction to Accountancy 2. Consumer Protection	2	2
	III	21	Skill Based I Core	Business Communication	4	4
	IV	22	Common	Yoga	2	2
				Sub Total	30*	25*

* Excluding the hours and Credit for Yoga

II B.Com Semester - IV

Semester	Part I/II/ III/ IV/V	Subject No.	Subject Status	Subject Title	Contact Hours Per week	Credit
	III	23	Language	Tamil-IV/Other Language	6	4
	III	24	Language	English-IV	6	4
	III	25	Major Core 7	Quantitative Techniques	5	4
	III	26	Major Core 8	Logistic Management	4	4
	III	27	Allied- IV	Application of Tally in Accounting	3	3
IV	IV	28	Non Major Elective II (Any one)	1. Financial Accounting 2. Human Rights	2	2
	III	29	Skill Based II – Core	Entrepreneurship Development	4	4
	V	30	Extension Activity	NCC/NSS/YRC/YWF	-	1
	IV	31	Common	Computer for Digital Era	2	2
				Sub Total	30*	26*

*Excluding the hours and Credit for Computer for Digital Era

Manonmaniam Sundaranar University
Tirunelveli
Choice Based Credit System
Course Structure for B.Com – Affiliated Colleges
(With effect from the Academic Year 2021-2022 onwards)
III B.Com Semester - V

Semester	Part I/II/ III/ IV/V	Subject No.	Subject Status	Subject Title	Contact Hours Per week	Credit
	III	32	Core 9	Corporate Accounting	6	4
	III	33	Core 10	Cost Accounting	6	4
	III	34	Core 11	Business Law	6	4
	III	35	Core 12	Research Methodology	5	4
V	III	36	Major Elective I (Any one)	1. Income Tax Law & Practice 2. Human Resource Management 3. Elements of E-Commerce	5	4
	IV	37	Skill Based III Common	Personality Development/Effective Communication/Youth Leadership	2	2
				Sub Total	30	22

III B.Com Semester - VI

Semester	Part I/II/ III/ IV/V	Subject No.	Subject Status	Subject Title	Contact Hours Per week	Credit
	III	38	Core 13	Special Accounts	5	4
	III	39	Core 14	Management Accounting	5	4
	III	40	Core 15	Industrial Law	5	4
	III	41	Core 16	Auditing and Corporate Governance	4	4
VI	III	42	Major Elective II (Any one)	1. Business Taxation 2. Retail Management 3. Human Values & Business Ethics	4	4
	III	43		Major Project	7	7
				Sub Total	30	27

For Problem Papers 40 % marks for theory and 60% marks for problems.

Proportion of marks between internal evaluation and external evaluation for subjects- 25:75.

Internal – 20 marks for theory and 5 marks for assignment.

Total Credits – 150 (Excluding the hours and Credit for Yoga and Computer for Digital Era)

II B. COM (IV SEMESTER) – UNDER CBCS
PART IV- NON – MAJOR ELECTIVE -II (SELECT ANY ONE) - 1
FINANCIAL ACCOUNTING

Objectives

1. To explain the concept and role of Accounting and financial reporting in the modern marketing economy.
2. To explain the regulatory frame work for the operation of fundamental accounting

Unit I:

Average Due Date- Utility of average due date- Problems.

Unit II:

Bank Reconciliation Statement – Meaning causes of difference between balance as per cash book and pass book – Need of Bank Reconciliation Statement – Preparation of Bank Reconciliation Statement.

Unit III:

Self-balancing Ledger – general ledger- debtors ledger- creditors ledger- Sectional balancing system.

Unit IV:

Depreciation – Meaning – Causes – Straight Line method and Written down value method – Simple problems only

Unit V:

Rectification of Errors- Classification of errors- suspense account- rectifying accounting entries (simple problem only)

Text Books

1. Dr.M.A.Arulanandam&K.S.Raman, Advanced Accountancy, Himalaya Publishing House, Mumbai.
2. P.Jain&K.L.Narang, Advanced Accountancy, Kalyani Publishers, New Delhi.

Reference Books

1. M.C.Shukla and T.S.Grewal, Advanced Accountancy, Sultan Chand &Co, New Delhi.
2. T.S.S. Reddy &A.Murthy, Advanced Accountancy, Margham Publications, Chennai.
3. P.C.Tulsian, Accountancy, Tata McGraw- Hill Company.

Outcomes:

1. To know the concept of average due date and its preparation.
2. To understand about the preparation of bank reconciliation statement.
3. To understand about the self balancing system and sectional balancing system and its various adjustment accounts.
4. To demonstrate and understanding of the various methods of providing depreciation.
5. To know about classification of errors and its rectification.

II B. COM (IV SEMESTER) – UNDER CBCS
PART IV- NON – MAJOR ELECTIVE -II (SELECT ANY ONE) - 2
HUMAN RIGHTS

Objectives

1. To understand the basic concepts of human rights
2. To have an understanding of the relationship between individual, group, and national rights

Unit I:

Human Rights- Definition of Human Rights - Characteristics of human rights - kinds of Human Rights - Civil and political – social, economic and cultural rights. (5 hours)

Unit II:

Violation of human rights - Patterns of violations and abuses - Action against violation of human rights as per Indian law

Unit III:

Rights of the Disabled Persons - Declaration on the rights of disabled persons 1975 - International year of disabled persons 1981

Unit IV:

Bonded labour - Concepts and definitions - Constitutional and legal provisions - Salient features of bonded labour system (abolition) Act 1976 - Role of the national human rights commission

Unit V:

Minorities Rights commission & its functions - Definitions - National commission for minorities - Functions of the commissions

Text Books

1. ParasDiwan, PeerushiDewan, Human Rights and Law.
2. Dr.Giriraj Shah, IPS & K.N. Gupta, Human Rights, IPS
3. JagannathMohany, Teaching of Human Rights

Reference Books

1. C. Nirmala Devi, Human Rights.
2. Concepts, Theories and Practice of Human Rights, Praveen Vadkar, Neha Publishers.
3. Baradat Sergio and SwaranjaliGhosh, Teaching of Human Rights, Dominant Publishers and Distributors, New Delhi, 2009.
4. Roy.A.N., Human Rights Tasks, Duties and Functions: Aavishakar Publications and Distributors, Jaipur.
5. Asish Kumar Das and Prasant Kumar Mohanty, Human Rights in India: Sarup and Sons, New Delhi.

Outcomes:

1. To impart basic knowledge about human rights and its types.
2. To know about violation patterns and action against such violations by law.
3. To understand about the rights of disabled persons.
4. To know about the legal provisions of bonded labour.
5. To understand about the minority rights commission and its functions.

III B. COM (V SEMESTER) – UNDER CBCS
PART III – MAJOR ELECTIVE -1 (SELECT ANY ONE) - 1
INCOME TAX LAW & PRACTICE

Objectives:

1. To understand the basic concepts of income tax
2. To enable the students to know the provisions of the income tax law.

Unit I

Basic concepts – Definition – Previous year – Assessment year – Person – Assessee – Income – Total Income – Casual income – Capital and Revenue – Residential status and incidence of tax incomes exempt under Section – 10

Unit II

Salary – Basis of charge – Different forms of salary – allowances – gratuity – pension – perquisites and their valuation – deduction from salary – computation of taxable salary .

Unit III

House property – basis of charge – determination of GAV and NAV – income from let – out property – deductions – computation of House property income

Unit IV

Profits and gains of business and profession – basis of charge – methods of accounting – deductions – allowable expenses and disallowable expenses – computation of taxable income - Income from Capital Gains – Income from other sources

Unit V

Income of other persons included in assesses total income – Aggregation of income; Set – off or carry forward and set off of losses – Deductions from gross total income – Computation of total income and tax payable; Rebates and relief's – Provisions concerning advance tax and tax deducted at source – Provisions for filing of return of income.

Text Books:

1. Dr.VinodK.Singhania, Taxmen's Direct Taxed Law & Practice, TaxmanPublications, New Delhi.
2. Dr. A. Murthy, Income Tax Law and Practice - Vijay Nichole Publications,Chennai.
3. Dr. T.S. Reddy &Dr.Hariprasad, Income tax law and practice, Margampublications, Chennai.

Outcomes:

1. To know the residential status and tax exemptions.
2. To compute the taxable salary.
3. To calculate house property income.
4. To identify the income from other sources
5. To understand the provisions for filing the return of income

III B. COM (V SEMESTER) – UNDER CBCS
PART III – MAJOR ELECTIVE -1 (SELECT ANY ONE) - 2
HUMAN RESOURCE MANAGEMENT

Objectives

1. To study about the importance of human resource.
2. To study the techniques of performance appraisal of employees.
3. To know the methods to redress the grievances of employees.

Unit I Introduction to Human Resource Management

HRM Concept and Functions, Role, Status and competencies of HR Manager - HR Policies - Evolution of HRM - HRM vs HRD - Evolution of HRM – Emerging Challenges of Human Resource Management - Workforce diversity; Empowerment - Human Resource Information System.

Unit II Acquisition of Human Resource

Human Resource Planning- Quantitative and Qualitative Dimensions – job analysis – job description and job specification - Recruitment And Selection – meaning – process of requirement – sources and techniques of Recruitment – Meaning and Process of Selection – Selection Tests And Interviews – placement, induction, socialization and Retention.

Unit III Training and Development

Concept and Importance -Training and development methods –Identifying Training and Development Needs - Designing Training Programmes – Role Specific and Competency Based Training - Evaluating Training Effectiveness - Training Process Outsourcing - Management Development – Career Development.

Unit IV Performance Appraisal

Nature, objectives and importance - Modern Methods and techniques of performance appraisal - potential appraisal and employee counselling – job changes - transfers and promotions -Problems in Performance Appraisal – Essentials of Effective Appraisal System – Job Evaluation – Concepts, Process and Objectives – Advantages and Limitations – Methods.

Unit V Compensation and Maintenance

Compensation - Concept and policies- wage and Salary administration - Methods of wage payments and incentive plans - Fringe benefits – Performance linked compensation - Employee health, welfare and safety social security - Employer-Employee relations- grievance handling and redressal – Grievance handling and redressal.

Text Books:

1. K. Aswathappa : Human Resource Management Text and Cases: Tata McGraw Hill, New Delhi.
2. George W Bohlander and Scott A Snell: Principles of Human resource Management: Cengage Learning, New Delhi.
3. P.G.Aqinas: Human Resource Management Principles and Practice: Vikas Publishing House Pvt. Ltd., New Delhi

Outcomes:

1. To know the system of human resource information.
2. To learn the process of selection of human resource.
3. To differentiate the management development and career development.
4. To understand the performance appraisal.
5. To identify the grievance handling and redressal.

III B. COM (V SEMESTER) – UNDER CBCS
PART III – MAJOR ELECTIVE -1 (SELECT ANY ONE) - 3
ELEMENTS OF E-COMMERCE

Objectives:

1. To enable the students to gain basic knowledge of Electronic-Commerce in the area of Business and Financing decisions

Unit I: Basics of e-Commerce

Commerce Framework -Traditional vs. Electronic Business Applications - The Anatomy of E-Commerce Applications

Unit II: Architectural View

Network Infrastructure for E-Commerce Components of the I-way-Global Information Distribution Networks – Public Policy Issues Shaping the I-way - The Internet as a Network Infrastructure - The Business of the Internet Commercialization

Unit III: Security

Network Security and Firewalls – Client Server Network Security – Firewalls and Network Security – Data and Message Security – Encrypted Documents and Electronic -Mail.

Unit IV: Application

Electronic Commerce and World-Wide-Web, Consumer Oriented E-Commerce, Electronic Payment Systems, Electronic Data Interchange (EDI), EDI Applications in Business, EDI and E-Commerce – EDI Implementation.

Unit V: Multimedia in e-Commerce

Multimedia and Digital video- key multimedia concepts, Digital Video and Electronic Commerce- Desktop Video processing – Desktop Video conferencing

Text Books:

1. Kalakota, R and Winston, AB 2002 Frontiers of Electronic Commerce, Addison Westey
2. David Kosiur, 2002 Understanding Electronic Commerce, Microsoft Press,
3. Saily Chan & John Wiley 2000 Electronic Commerce Management, Tata McGraw Hill, New Delhi.

Outcomes:

1. To gain knowledge of e-commerce applications.
2. To know the functions of internet.
3. To identify the network security data and message security.
4. To understand the applications of EDP.
5. To differentiate the multimedia and digital video.

III B. COM (VI SEMESTER) – UNDER CBCS
PART III – MAJOR ELECTIVE – II (SELECT ANY ONE) -1
BUSINESS TAXATION

Unit I:

Indirect taxes – Meaning and Nature - Special features of Indirect Taxes- Contribution to government revenues - Taxation under the Constitution - Advantages and Disadvantages of Indirect Taxes.

Unit II Good and Service Tax Introduction

Meaning - Need for GST - Advantages of GST - Structure of GST in India – Dual concepts - SGST-CGST-IGST-UTGST Types of Rates under GST – Taxes subsumed under State Goods and Services Tax Act 2017- Taxes subsumed under Central Goods and Services Tax Act 2017. Meaning of important terms: Goods, services, supplier, business, manufacture, casual taxable person, aggregate turnover, input tax and output tax.

Unit III Levy and Collection

Levy and Collection under SGST/CGST Acts - Concept of supply – Composite and Mixed supplies - Composition Levy - Time of supply of goods and services - Value of Taxable supply - Input Tax credit - Eligibility and conditions for taking input credit- Reverse charge under the GST- Registration procedure under GST- Concept of e-way Bill - Filing of Returns.

Unit IV Integrated GST

Levy and Collection under The Integrated Goods and Services Tax Act 2017-Meaning of important terms: Integrated tax, intermediary, location of the recipient and supplier of services, output tax. Levy and Collection of Tax-Determination of nature of Supply- Inter-State supply and Intra-State supply-Place of Supply of Goods or Services - zero-rated supply.

Unit V Customs Laws in India

Introduction to Customs Laws in India – The Customs Act 1962 - The Customs Tariff Act 1975- Levy and Exemption from Custom duty - Taxable event - Charge of Custom duty- Exemptions from duty – Customs procedures for import and export - Meaning of Classification of goods - Methods of valuation of imported goods - Abatement of duty in damaged or deteriorated goods - Remission on duty on lost, destroyed or abandoned goods - Customs duty drawback.

Books for Reference:

1. Indirect Taxes- V.S.Datey. Taxmann Publication(p) Ltd. New Delhi
2. Indirect Taxes: GST and Customs Laws - R. Parameswaran and P. Viswanathan - Kavin Publications-Coimbatore
3. Glimpse of Goods and service tax - Sathpal Puliana
4. Handbook of GST - Law and practice-Gaurav Gupta
5. GST Law and Practice-SS Gupta
6. Indirect Taxation - V. Balachandran. Sultan Chand & Co. New Delhi

Outcomes:

1. To understand basic concept and importance of indirect taxes.
2. To understand the various concept and types of Goods and Service Tax.
3. To understand and make use of knowledge of GST in taking managerial decision in varioustax related matters.
4. To get familiar with the Integrated Goods and Services Tax Act 2017.
5. To know the Customs procedures for import and export

III B. COM (VI SEMESTER) – UNDER CBCS
PART III – MAJOR ELECTIVE – II (SELECT ANY ONE) -2
RETAIL MANAGEMENT

Objectives

1. To explore the functionalities in the retail management
2. To understand the retail management concepts

Unit I:

Introduction to retailing- nature and importance of retailing - contemporary retailing in India and marketing challenges facing retailers - Strategic planning in retailing - owning or managing business - retailing life cycle

Unit II:

Types of retailing institutions- retailing institutions by ownership - retailing institutions by store based and non-store based - vertical marketing system - traditional retailing.

Unit III:

Strategic planning in retailing- understanding retailing environment - identifying and understanding customers, information gathering.

Unit IV:

Location and organizational decisions- Trading area analysis site selection - organizational pattern in retailing - operational management - financial decisions - use of technology

Unit V:

Merchandise Management- Buying and handling - product assortment decision - Inventory Management - Merchandise pricing - Merchandise Labelling and packing - Role of atmosphere - retail promotion mix strategy - retail store sales promotion schemes.

Text / Reference Books

1. Dr.Harjit Singh “Retail Management”, Sultan Chand Publications.
2. Chetan Bajaj “Retail Management”, Oxford University Press.
3. Gibson G. Vedamani, Retail Management: Functional Principles & Practices, Jaico Books.
4. SwapnaPradhan, Retailing Management, Tata McGraw-Hill Publishing Company Limited, New Delhi.
5. Michael Levy and Barton A Weot, Retail Management, McGraw-Hill Irwin.
6. Cox, Roger and Paul Brittain, Retail Management, Prentice Hall, Harlow.
7. Michael Levy, Barton A Weitz, Ajay Pandit, Retailing Management, McGraw-Hill Company.
8. Berman Barry, Evans Joel R., Retail Management: A Strategic Approach, Pentice Hall of India.

Outcomes:

1. To understand basic concept, importance and challenges facing retailers .
2. To identify the types of retailing institutions.
3. To understand Strategic planning process in retailing.
4. To identify the organizational Location and financial decisions.
5. To know the role and functions of Buying and handling of Merchandise Management

III B. COM (VI SEMESTER) – UNDER CBCS
PART III – MAJOR ELECTIVE – II (SELECT ANY ONE) -3
HUMAN VALUES & BUSINESS ETHICS

Objectives

1. To understand values in business
2. To inculcate the ethical practices in business among the students

Unit I:

Introduction to Values - Values in the society, politics, inter-personal relations, economics and business- Morals - Value and Vision statements in organizations - Focusing on Innovation, Reliability, Customer satisfaction, Quality assurance, Profitability, Utility, Productivity etc. and the continuous improvement in their standards.

Unit II:

Ethics as the art of choosing between right and wrong– Interpreting the consequences and choosing the right- Ideas of freedom of choice, equality, justice, fairness in dealing with customers, society, environment - Application of Values and ethics in business - Examples from Business

Unit III:

Government interactions: Use and Misuse of government incentives, subsidies and licenses - Tax evasions. Ethics in Human Resources employment in Business: in hiring, compensating, work assignments - discrimination; Marketing: ethics in Pricing policies and strategies, misleading advertisements; Policies relating to exchange and return of goods sold.

Unit IV:

Ethics in Production: Poor quality, risky products, defective/untested products, unauthorized copies/imitations, Quality Policy: Zero defect and quality of ingredients, components, ISI, AG Marks, Hall Mark, Patents, Copy rights, post-sales services.

Unit V:

Legal and self imposed norms- for doing good business and earning goodwill - Handling customer complaints, Problems- examples from consumer goods and services oriented industries (Tourism, Travel, Telephones, Edible goods, Health etc.)

Text and Reference books

1. Colin M. Fisher and Alan Lovell, Business Ethics and Values, F.T. Prentice Hall, 2006.
2. G.P. Martin, Glenn Martin, Human Values and Ethics in the Work place, 2010.

Outcomes:

1. To understand values in business and Customer satisfaction in society.Productivity etc. and the continuous improvement in their standards
2. To gain an application of Values and ethics in business
3. To know the Government interactions and Ethics in Business pricing policies andstrategies
4. To apply and understand Ethics in Production
5. To understand how to handle customer complaints and services-oriented industries

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI

PG – COURSES - AFFILIATED COLLEGES

Course Structure for M.Com

(Choice Based Credit System)

(With effect from the Academic Year 2021 – 2022 onwards)

Sem	Sub. No.	Subject status	Subject Title	Contact Hrs./ Week	Credits
I	1	Core-1	Accounting for Management	6	4
	2	Core-2	Statistics	6	4
	3	Core-3	Management Concepts and Organisational Behaviour	6	4
	4	Core-4	Insurance and Risk Management	6	4
	5	Core-5	International Business	6	4
				30	20
II	6	Core-6	Advanced Financial Management	6	4
	7	Core-7	Quantitative Techniques	6	4
	8	Core-8	Corporate Legal Framework	4	4
	9	Core-9	Enterprise Resource Planning	5	4
	10	Core-10	Corporate Social Responsibility	5	4
	11	Elective-1	From list	4	3
				30	23
III	12	Core-11	Advanced Corporate Accounting	6	4
	13	Core-12	Taxation and Tax Planning	6	4
	14	Core-13	Computerized Accounting with Tally	5	4
	15	Core-14	Human Resource Management	5	4
	16	Core-15	Business Research Methods	4	4
	17	Elective-2	From list	4	3
				30	23
IV	18	Core-16	Applied Costing	6	4
	19	Core-17	Indirect Taxation	6	4
	20	Core-18	E-Commerce	5	4
	21	Core-19	Financial Markets and Institutions	5	4
	22	Core-20	Project	8	8
				30	24
		Total		120	90

Electives for II Semester

1. Credit Management
2. Business Analytics
3. Customer Relationship Management

Electives for III Semester

1. Consumer Rights and Education
2. Financial Derivatives
3. Management Information System

For the Project, flexible credits are b/w 5 – 8 & Hours per week are b/w 10 - 16.

Total number of credits ≥ 90	: 90
Total number of Core Courses	: 20 (19 T + 1 Prj.)
Total number of Elective Courses	: 2
Total hours	: 120

Total Credits

First Semester	: 20 credits
Second Semester	: 23 credits
Third Semester	: 23 credits
Fourth Semester	: 24 credits
Total number of Credits	: 90
Total number of papers/courses	: 22

Internal Assessment: Internal Assessment is for 25 marks.

Internal Assessment shall be done in the following manner:

- | | | |
|------|---|-------------|
| i) | The average of the best two scores of the students from three tests of an hour duration shall be averaged | -- 15 marks |
| ii) | Assignment | -- 4 marks |
| iii) | Seminars | -- 6 marks |
| | | ----- |
| | | 25 marks |
| | | ===== |

Passing Minimum:

- There is a pass minimum of 50 for external and overall components :
- For all problems involving papers 60% for problem and 40% for theory questions shall be asked.
- (For GST and Customs Procedure: Theory 80% and Problem 20%)

Industrial Visit:

Industrial visits are compulsory for students of commerce. On duty leave shall be sanctioned to the staff accompanying the students.

Eligibility for admission:

A Candidate who has passed the B.Com, or B.A. (Corporate Secretaryship), or B.B.A., (Bank Management), or B.A. (Co-op), or B.A. (Indus. Org.) or B.Com.(C.A) degree is eligible for admission in to M.Com.

CREDIT MANAGEMENT

L	T	P	C
4	0	0	3

Objectives:

1. To enable the student to understand what credit management is, what are the lending types and process and how to monitor the credit.
2. To lay a foundation for more complex credit management topics that arise credit policies, credit appraisal and NPA
3. To inculcate advanced skills for handling credit management issues
4. To help know financial support to the agriculture and NABARD schemes to promote agri-business in India
5. To understand about retail lending and its banking product

Unit I Introduction and Overview of credit:Principles of Lending : Safety, Liquidity & Profitability - Purpose of Loan - Diversification Risk- Model Credit Policy for individual and all types of organisation - **Types of Credit Facilities :** Various Types of Credit Facilities - Cash Credit, Overdrafts, Demand Loan, Bills Finance - Drawee Bill Scheme and Bills Discounting - **Credit Delivery :** Types of Facilities, Modes of Delivery, Sole Banking Arrangement, Multiple Banking Arrangement, Consortium Lending, Syndication. Credit Thrust, Credit Priorities, Credit Acquisitions Discounting - Dimensions of Credit Appraisals

Unit II Overview of credit policies and project appraisals:The credit process – Characteristics of different types of loans- Evaluating commercial loan requests – Financial statement analysis- Cash flow analysis- Projections-Management of the firm and other factors –Feasibility study – Fundamental credit issues - Credit analysis- Project / Term Loan Appraisal : Technical Appraisal - Commercial / Market Appraisal - Managerial Appraisal - Financial Appraisal - Economic Appraisal - Environmental Appraisal

Unit III Evaluating consumer loans & loan and advances against pledge: Types of consumer loans- Credit analysis of consumer loans- Risk–return analysis of consumer loans- Customer profitability analysis and loan pricing- Fixed Vs floating rates - Hypothecation- Mortgage – Lien- Advances against goods- Document to title to goods – Life insurance policies – Stock exchange securities-Fixed deposit receipts – Book debts- Supply bills- Real Estates – Advance against collateral securities-Corporate Finance – Project Finance

Unit IV Agricultural finance and retail lending: Crop loans- Crop insurance schemes- Dairy- Sericulture- Poultry- Animal husbandry – Horticulture – Kissan credit cards – NABARD initiatives – Lead bank schemes – Retail Lending: Characteristic of Retail Loans - Advantages of Retail Loans - Retail Banking Vs Corporate Banking - Various Retail Banking Products - Model Retail Banking Products

Unit V Credit Monitoring and NPA Management: Credit Monitoring, Supervision & Follow Up : Credit Monitoring - Meaning, Monitoring Goals - Process of Monitoring - Different Monitoring Tools - Check-list for Monitoring - Monitoring by using various statements - NPA – Causes and Remedial Measures – Identification of NPAs – Debt Recovery Tribunals – Asset Reconstruction Fund - effect of NPA on profitability

BUSINESS ANALYTICS

L	T	P	C
4	0	0	3

Objectives

1. To enable students to learn the basics of business data analytics platforms
2. To teach quantitative analysis including sampling etc
3. To learn advanced statistical techniques such as multivariate analysis etc
4. To gain an understanding of the nuances of data mining
5. To teach the techniques of regression analysis

UNIT I Introduction to Data Analytics Platform - Visualizing Data - Describing and Summarizing Data - Challenges of Conventional Systems - Intelligent Data Analysis - Analytic Methodologies or Techniques Used in Logical Analysis

UNIT II Quantitative Analysis - Sampling Methods and Estimation – Probability Distributions - Descriptive Statistics - Inferential Statistics - Hypothesis Testing, Explanatory and Predictive Models, and Fact-Based Management to Drive Decisions and Actions - Tools - Analysis vs Reporting.

UNIT III One-Sample Tests - Two Independent Samples Tests - K Related Samples Tests - Measures of Correlation and Association - Multivariate Nonparametric Test for Interdependence - Probability and Decision Making Under Uncertainty - Normal, Binomial, Poisson, and Exponential Distributions

UNIT IV Data Mining - Importing Data into Excel - SQL - Analysis of Variance and Experimental Design - Statistical Process Control - Statistical Reporting - Foundations, Methods, Interpretations in Excel – R – STATA – PSPP – EVIEWS – Machine Learning.

UNIT V Regression Analysis - Estimating Relationships - Linear versus Nonlinear Relationships - Statistical Inference - Time Series Forecasting - Introduction to Optimization and Simulation Modeling – Optimization and Simulation Model - Decision Support System

Learning Outcome :

After the completion of the course, the students must be able to:

1. Gain an understanding of the basics of business data analytics platforms
2. Gain knowledge of quantitative analysis including sampling etc
3. Learn advanced statistical techniques such as multivariate analysis etc
4. Describe the nuance of data mining
5. Gain knowledge of techniques of regression analysis

References :

1. Bowerman, B. (2016). Business Statistics in Practice: Using Data, Modeling, and Analytics. McGraw-Hill Higher Education
2. Christian Albright, Wayne L. Winston (2015). Business Analytics : Data Analysis and Decision Making 5th Edition, CENGAGE
3. Cliff, T. (2014). Exploratory Data Analysis in Business and Economics: An Introduction Using SPSS, Stata, and Excel: Springer, New York, New York, 215
4. Gert H. N. Laursen, Jesper Thorlund (2018). Business Analytics for Managers, 2ed: Taking Business Intelligence Beyond Reporting, Wiley

5. Kumar, U. D. (2017). Business Analytics the Science of Data-Driven Decision Making. Wiley
6. Ledolter, J. (2013). Data mining and business analytics with R. John Wiley & Sons
7. Jensen, C. (2017). Data Science for Business: Data Analytics Guide with Strategies and Techniques
8. Prasad R N and Seema Acharya (2016). Fundamentals of Business Analytics, 2ed,
9. WileyWilliams, S. (2016). Business intelligence strategy and Big Data analytics: a general management perspective. Morgan Kaufmann

CUSTOMER RELATIONSHIP MANAGEMENT

L	T	P	C
4	0	0	3

Objectives

1. To impart skill based knowledge of Customer Relationship Management
2. To understand the concepts and principles of CRM
3. To understand the need and importance of maintaining a good customer relationship
4. To gain knowledge of strategic customer acquisition and retention techniques in CRM
5. To teach the conceptual aspects of service quality

UNIT I Understanding customers: Customer information Database – Customer Profile Analysis – Customer perception- Expectations analysis – Customer Behavior in relationship perspectives; individual and group customers – Customer life time value – Selection of Profitable customer segments

UNIT II CRM structures: Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications.

UNIT III CRM Planning and Implementation: Strategic CRM planning process – Implementation issues – CRM Tools- Analytical CRM – Operational CRM – Call centre management – Role of CRM Managers – CRM Implementation Road Map- Developing a Relationship Orientation – Customer-centric Marketing Processes – Customer retention plans

UNIT IV Service quality: Concept of Quality – Meaning and Definition of Service Quality - Factors influencing customer expectations and perceptions – Types of Service Quality – Service Quality Dimensions – Service Quality Gaps – Measuring Service Quality – Service Quality measurement Scales.

UNIT V Trends in CRM: CRM Solutions – Data Warehousing – Data mining for CRM – CRM software packages – The Technological Revolution: Relationship Management – Changing Corporate Cultures.

Learning Outcome:

After the completion of the course, the students must be able to:

1. Gainskill based knowledge of Customer Relationship Management
2. Understand the concepts and principles of CRM
3. Gainknowledge on the need and importance of maintaining good customer relationship
4. Gainknowledge of strategic customer acquisition and retention techniques in CRM
5. Describe the conceptual aspects of service quality

References :

1. Alok Kumar et al, (2015), Customer Relationship Management: Concepts and Applications, Biztantra
2. Jim Catheart, (2016), The Eight Competencies of Relationship selling, Macmillan India
3. Peeru H Mohamed and A Sahadevan, (2017), Customer Relationship Management, Vikas Publishing
4. Shainesh, Jagdish, N.Sheth, (2015), Customer Relationships Management Strategic Perspective.

ADVANCED CORPORATE ACCOUNTING

L	T	P	C
6	0	0	4

Objectives:

1. To educate students on recent developments in corporate accounting
2. To teach the students on various requirements of corporate reporting.
3. To develop skill in preparation of accounts of companies.
4. To help the students to understand the techniques of restructuring and liquidating corporate entities.
5. To make the students to qualify to get employment in corporate companies

Unit I Alteration of Share Capital& Amalgamation Absorption and Reconstruction;

Alteration of Share Capital - Procedure for Reducing Share capital. Amalgamation, absorption and External reconstruction - Methods of Computing purchase consideration-types of amalgamation. Internal reconstruction Vs External reconstruction – simple problems.

Unit II Valuation of Goodwill& Liquidation of companies: Valuation of Goodwill – Factors determining the value of Goodwill-Methods of valuation of Goodwill. Valuation of shares – Methods of valuation of shares – Liquidation of companies – Liquidators final statement of accounts – simple problems. (15L)

Unit III Accounts of Banking Companies: Accounts of Banking companies - Rebate on bills discount – Assets classification and provisions – preparation of various schedules and final accounts – Simple problems. (15L)

Unit IV Accounts of Insurance companies: Accounts of Insurance companies : Life Insurance and General Insurance – Preparation of various schedules and final accounts. Simple problems. (20L)

Unit V Double Accounting & Accounts of Holding Companies: Double Accounting – Accounts of Electric supply companies (including railways and public utilities). Replacement of assets – preparation of final accounts. Accounts of Holding companies : steps involved in preparation of consolidated balance sheet - legal provisions – simple problems. (20L)

Learning Outcome:

1. On the successful completion of this course the student will be able to gain knowledge and understand the concepts and practices of company accounts
2. The students shall have a comprehensive understanding on the advanced issues in accounting.
3. The students shall acquire a thorough knowledge in banking accounts. It helps them even to appear for competitive bank examinations.
4. The students shall get an exposure on the accounts of electricity companies

References :

1. Advanced Accountancy ,S.P.Jain and K.L.Narang.
2. Advanced Accounts,M.C.Shukla, T.S.Grewal, S.C.Gupta
3. Advanced Corporate accounts – by M.A.Arulanandam, K.S.Raman
4. Advanced Accountancy, R.L.Gupra, M.Radhaswamy

CONSUMER RIGHTS AND EDUCATION

L	T	P	C
4	0	0	3

Objectives

1. To give the students a clear understanding of the terms Consumers, Consumerism, Consumer movement
2. To give an understanding of the provisions of the Consumer Protection Act
3. To know the methods of creating awareness and education
4. To familiarize students on various aspects of consumer related Legislations and Organizations
5. To make the students aware about the rights and responsibilities of consumers

Unit I Consumer Movement in India- Definition of Consumer- Types of Consumer –Problems of Consumer – Consumerism- Emerging concepts in consumerism: Green Consumerism, Cyber Consumerism- effects of consumerism.

Unit II Right of Consumers- Responsibilities of Consumers —unfair trade practices-Caveat emptor and Caveat Venditor- Enforcement of Consumer rights through Public Interest Litigation

Unit III Consumer Protection Act 2019- Main Provisions –Redressal forums –District Level –State Level and National Level –Powers and Functions –Filing of Complaints Procedure Regulatory Authorities and OMBUDSMAN

Unit IV Consumer related Legislations and Organizations: Prevention of Food Adulteration Act, 1954- Standards of Weights and Measures Act, 1976- The Drugs and Magic Remedies (Objectionable Advertisement) Act 1954 - Consumer pressure groups-voluntary consumer organizations-Consumer Protection Councils -Remedy and Redressal of Grievances

Unit V Consumer awareness and Education in India:Lack of awareness- Lack of access to information- Methods of creating awareness and promotion of Consumer rights and duties- E-Commerce and Consumer Rights- Role of media in consumer education

Learning Outcomes:

At the end of this course, the Students will be able to:

1. Understand the various terms related to Consumers
2. Know the Consumers rights and duties and how to enforce their rights
3. gain knowledge of the provisions and procedures under Consumer Protection Act
4. familiar with Consumer related Legislations and Organisations
5. know the methods of creating awareness and education

References :

1. Singh Avtar, (2010), Law of consumer protection (Principles and Practice) Eastern Book Company, Luck now.
2. Aggarwal V.K, Consumer Protection Law and practice, Bharat Law House Pvt Ltd. New Delhi
3. Majaumdar P K (2009), Law of Consumer Protection in India, Orient Publishing Company, New Delhi.
4. Balakrishna Eradi (2009), Consumer protection–Jurisprudence, Lexis Nexis Butter worth publishing
5. Bangia R.K., (2004), A Handbook of Consumer Protection Laws and Procedure, Allahabad Law Agency

FINANCIAL DERIVATIVES

L	T	P	C
4	0	0	3

Objectives

1. To make the students understand about the concept of Derivatives and its types
2. To acquaint the knowledge of Options and Futures
3. To teach about hedging and the development position of derivatives in India
4. To gain an understanding about the financial derivatives market in India
5. To enable the students to know about stock futures

Unit I Introduction to derivatives –Definition of Financial derivatives- Features – Types— History of Derivatives Markets – Uses of Derivatives - Forward Market:Forward Contract concept – Features – Classification of Forward Contracts –Forward Trading Mechanism – Forward Prices Vs Future Prices.

Unit II Options and Swaps – Concept – Types – Option Valuation– Option Positions Naked and Covered Option – Underlying Assets in Exchange-traded Options – Determinants of Option Prices – Binomial Option Pricing Model – Black-Scholes Option Pricing – Basic Principles of Option Trading – SWAP: Concept, Evaluation and Features of Swap – Types of Financial Swaps – Interest Rate Swaps – Currency Swap – Debt-Equity Swap.

Unit III Futures – Financial Futures Contracts – Types of Financial Futures Contract –Evolution of Futures Market in India – Traders in Futures Market in India – Functions and Growth of Futures Markets- Theories of Future prices – Future prices and Risk Aversion – Forward Contract Vs. Futures Contracts.

Unit IV Hedging and Stock Index Futures – Concepts – Perfect Hedging Model – Basic Long and Short Hedges – Cross Hedging — Hedging Objectives – Management of Hedge – Concept of Stock Index – Stock Index Futures – Stock Index Futures as a Portfolio management Tool – Speculation and Stock Index Futures – Stock Index Futures Trading in Indian Stock Market.

Unit V Financial Derivatives Market in India – Need for Derivatives – Evolution of Derivatives in India – Major Recommendations of Dr. L.C. Gupta Committee –Derivatives Trading at NSE/BSE – Eligibility of Stocks –Emerging Structure of Derivatives Markets in India – Foreign Exchange Management

Learning Outcomes :

After the completion of the course, the students must be able to:

1. Gain an understanding of the concept of Derivatives and its types
2. Get acquainted about Options and Futures
3. Describe about hedging and the development position of derivatives in India
4. Gain mastery over the financial derivatives market in India
5. Understand about stock futures

References :

1. Gupta S.L., (2008), Financial Derivatives – Theory, Concepts and Problems, Prentice Hall of India, Delhi
2. Kumar S.S.S (2007), Financial Derivatives, Prentice Hall of India, Delhi
3. Chance, Don M (2001), Derivatives and Risk Management Basics, Cen gage Learning, Delhi
4. Stulz M. Rene, (2009), Risk Management and Derivatives, Cen gage Learning, Delhi

MANAGEMENT INFORMATION SYSTEM

(Elective Course)

L	T	P	C
4	0	0	3

Objectives

1. To offer in-depth knowledge on information systems in business and their management
2. To teach the objectives and components of data base management systems
3. To know the approaches involved in developing MIS
4. To enable students to know transaction processing and Support system
5. To gain knowledge on functional Information systems

Unit I Management Information System – Concept, Need, Strategic role – Evolution of Management Information System – Components of Management Information System – Information flow

Unit II Data base management systems – Objectives and Components – Database design – Creation and control – Recent trends in database

Unit III Developing information system – Planning, Designing and redesigning – Approaches for system development – System analysis and Design – system Implementation and Maintenance

Unit IV Transaction processing and Support system – Transaction processing system – Office automation systems – Decision support systems – Executive information systems – Artificial intelligence and Expert systems

Unit V Functional Information systems – Production, Finance, Human resource and Marketing – Managing information resources – Information Security – Control & Audit of Information Systems

Learning Outcome :

After the completion of the course, the students must be able to:

1. Gain in-depth knowledge on information systems in business and their management
2. Learn the objectives and components of data base management systems
3. Know the approaches involved in developing MIS
4. Know transaction processing and Support system
5. Gain knowledge on functional Information systems

References :

1. Azam M (2012), Management Information Systems, Vijay Nicole Imprints
2. Davis (2013), 'Management Information Systems', McGraw Hill
3. Eff Oz (2001), 'Management Information Systems', Vikas Publishing house Pvt. Ltd
4. Goyal D P (2010), 'Management Information Systems – Managerial Perspectives', Mac Millan India Ltd
5. James A O' Brain (2014), Management Information Systems', Tata McGraw Hill
6. Kenneth C.Loudan& Jane P.Loudan (2016), "Essentials of MIS", Prentice Hall India
7. Muneesh Kumar (2001), 'Business Information Systems', Vikas Publishing house Pvt. Ltd
8. Prasad L M, Usha Prasad (2012), 'Management Information Systems', Sultan chand& Sons
9. Sadagopan S (2012), 'Management Information System', Prentice Hall
10. Wetherbe, Turban (2000), 'Information Technology for Management', John Wiley publisher

M.COM., GENERAL

SYLLABUS

**FROM THE ACADEMIC YEAR
2023 - 2024**

**TAMILNADU STATE COUNCIL FOR HIGHER
EDUCATION, CHENNAI - 600 005**

**Credit Distribution for PG Programme in Commerce M.Com.
(General)**

First Year

First Semester

	Course	Credit	Hours per Week
Part I	Core I - Business Finance	5	7
	Core II - Digital Marketing	5	7
	Core III - Banking and Insurance	4	6
	Elective IA-Security Analysis and Portfolio Management (or) I B - Operations Research	3	5
	Elective II A – Behavioural Finance (or) II B -Export Import procedures and documentation	3	5
		20	30

M.Com. (General)

First Year

Elective –I A

Semester I

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT		5	-	-	-	3	5	25	75	100

Learning Objectives	
1.	To become familiar with various Investment avenues and Portfolio Construction
2.	To understand the Equity Shares, Preference Shares and Bonds valuation models
3.	To learn about long-term and short-term investment analysis tools.
4.	To analyse with Portfolio theories.
5.	To gain knowledge in Portfolio performance methods.

Course Units

UNIT I (15 hrs) Investment and Portfolio Management Investment – Meaning – Nature and scope of Investment – Investment vs Speculation – Type of Investors – Investment Avenues – Factors influencing the investment choice – Portfolio Management: Meaning and significance, Active Vs. Passive portfolio management - Strategic Vs. Tactical asset allocation - Factors Affecting Investment Decisions in Portfolio Management.
UNIT II (15 hrs) Valuation of Securities Bond: Introduction – Reasons for issuing Bonds –Features of Bond – Types of Bonds – Determinants of bond safety –Bond Prices, Yields and Interest Rates –Measuring Price Volatility of Bonds–Macaulay Duration and Modified Duration - Preference Shares: Introduction – Features of Preference Shares – Preference Shares Yield – Holding Period Return – Yield to Call –Concept of Present Value – Equity Share Valuation Models.

UNIT III **(15 hrs)****Fundamental Analysis and Technical Analysis**

Fundamental Analysis: Objectives – Economic Analysis, Industry Analysis, Company Analysis – Technical Analysis: Meaning– Assumptions – Pros and cons of technical analysis–Differences between fundamental analysis and technical analysis – Dow Theory – Types of Charts – Chart Patterns – Trend Analysis – Support Line and Resistance Line – Volume Analysis – Indicators and Oscillators – Simple Moving Average – Exponential Moving Average – Relative Strength Index – Bollinger Band – Elliott Wave Theory.

UNIT IV **(15 hrs)****Efficient Market Hypothesis**

Efficient Market Hypothesis – Markowitz Model, Arbitrage Pricing Theory – Sharpe’s Single index portfolio selection method – Capital Asset Pricing Model (CAPM).

UNIT V **(15 hrs)****Portfolio Performance Evaluation**

Portfolio Performance Evaluation – Meaning - Need for Evaluation - Methods of calculating Portfolio return - Sharpe’s Ratio - Treynor’s Ratio - Jensen’s Differential Returns - Portfolio Revision - Need for Portfolio Revision - Formula Plans.

Course Outcomes

Students will be able to:

CO No.	CO Statement	Knowledge level
CO 1	Examine investment options and structure a portfolio	K4
CO 2	Assess the value of Equity Shares, Preference Shares and Bonds	K5
CO 3	Examine stock performance through fundamental and technical analysis	K4
CO 4	Examine the various Portfolio Theories.	K4
CO 5	Evaluate the portfolio performance.	K5

Books for study:

1. Prasanna Chandra (2021), “Investment Analysis and Portfolio Management”, 6th Edition, McGraw Hill, Noida, UP
2. Rustagi RP (2022), “Investment Analysis and Portfolio Management”, 5th Edition, Sultan Chand & Sons, New Delhi
3. Bhalla V.K. (2019), “Investment Management”, 19th Edition, S.Chand& Co. Ltd., New Delhi

Books for reference:

1. Donald E. Fischer, Ronald J. Jordan, Ashwini. K. Pradhan (2018), “Security Analysis Portfolio Management”, 7th Edition, Pearson Publication Pvt.Ltd., India, Noida
2. Avadhani V.A. (2016), “Securities Analysis and Portfolio Management”, 12th Edition, Himalaya Publishing House, Mumbai
3. Ranganathan M. and Madhumathi R (2012), “Security Analysis and Portfolio Management”, 2nd Edition., Pearson Education India Pvt Ltd, Noida
4. Punithavathy Pandian (2019), “Securities Analysis and Portfolio Management”, Himalaya Publishing House, Mumbai
5. Subrata Mukherjee (2021), “Security Analysis and Portfolio Management”, S.Chand& Co. Ltd, New Delhi

Web references:

1. https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_SAPM_Lecture_Notes.pdf
2. <https://www.studocu.com/in/document/galgotias-university/equity-portfolio-management/portfolio-management-lecture-notes-1-10/17701348>
3. <https://www.educba.com/fundamental-analysis-vs-technical-analysis>

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	1	3	2	3	2	2	3
CO2	3	3	1	3	2	3	2	3	2
CO3	3	3	2	3	2	3	2	3	2
CO4	2	3	1	3	2	2	2	3	2
CO5	3	3	1	3	2	2	2	3	2

High – 3

Medium – 2

Low – 1

M.Com. (General)

First Year

Elective – I B

Semester I

OPERATIONS RESEARCH

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	OPERATIONS RESEARCH		5	-	-	-	3	5	25	75	100

Learning Objectives	
1	To outline the fundamentals of Operations Research
2	To use OR models for problem solving
3	To examine the role of sequencing and game theory
4	To design and apply network analysis
5	To apply modelling techniques

Course Units

UNIT I	(15 hrs)
Introduction and Linear Programming Problem	
Introduction to Operations Research – Uses and Limitations – Linear Programming Problem: Formulation, Solving LPP: Graphical method, Simplex method, the Big-M Method.	
UNIT II	(15 hrs)
Transportation and Assignment Problems	
Transportation problem: Introduction – Assumptions – Formulation of Transportation models – Basic feasible solution (North-West Corner Method, Least Cost Method, Vogel’s Approximation Method) – Optimal solution (Stepping-Stone Method, Modified Distribution Method) – Degeneracy in Transportation problem. Assignment Problem: Introduction – Comparison with the Transportation problem – Formulation of assignment problems - The Hungarian method of solution.	

UNIT III	(15 hrs)
Sequencing and Game Theory	
Sequencing problem: Introduction – Assumptions – Processing of n jobs through one machine – Processing n jobs through two machines – Processing of n jobs through three machines. Game Theory: Introduction – Rules for Games theory – Two person zero sum game without saddle point – Mixed strategies (2xn games, mx2 games) – Graphical method (2xn, mx2 games).	
UNIT IV	(15 hrs)
Replacement and Network Analysis	
Replacement: Introduction – Individual replacement problems – Group replacement problems. Network Analysis: PERT and CPM.	
UNIT V	(15 hrs)
Decision Tree Analysis and Queuing Theory	
Decision Tree analysis – Queuing: Introduction – Applications of queuing models, Waiting time and idle time costs – Single channel Poisson arrivals with Exponential Service, Infinite population model.	

Course outcomes

Students will be able to:

CO No.	CO Statement	Knowledge level
CO 1	Apply Linear Programming	K3
CO 2	Identify models for problem solving	K3
CO 3	Apply sequencing and game theory	K3
CO 4	Apply network analysis to enhance effectiveness	K3
CO 5	Examine the models for decision making	K4

Books for study:

1. Gupta P.K and Hira D.S.,(2022) “Operations Research”, 7th Edition, S.Chand, Noida (UP).
2. Kapoor V.K., (2014) “Operations Research”, 9th Edition, Sultan Chand, New Delhi.
3. Natarajan, Balasubramani and Tamilarasi, (2014) “Operations Research”, 2nd Edition, Pearson Education India, Noida.
4. Kothari C.R.,(2022) “An Introduction to Operational Research”, 3rd Edition, S.Chand, Noida (UP)

Books for reference:

1. Tulsian P.C. and Bharat Tulsian, (2022) “Fundamentals of Operations Research(Theory and Practice)”,3rd Edition, S. Chand, Noida (UP).
2. Sharma J.K.,(2016) “Operations Research”, 6th Edition, Lakshmi Publications, Chennai.
3. Nagarajan N.,(2017) “Text Book of Operations Research: A Self Learning Approach”, New Age Publications, Chennai.
4. Rina Rani Rath,(2021) “Operations Research”, 2nd Edition, Bhavya Books, New Delhi.

Web references:

- 1) <https://www.bbau.ac.in/dept/UIET/EMER-601%20Operation%20Research%20Queuing%20theory.pdf>
- 2) [https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-06-34_OPERATIONS%20RESEARCH%20TECHNIQUES\(20MAT22C5\).pdf](https://mdu.ac.in/UpFiles/UpPdfFiles/2021/Jun/4_06-11-2021_16-06-34_OPERATIONS%20RESEARCH%20TECHNIQUES(20MAT22C5).pdf)
- 3) <https://repository.up.ac.za/bitstream/handle/2263/25427/02chapter3.pdf?sequence=3>
- 4) <https://hbr.org/1964/07/decision-trees-for-decision-making>

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO 1	3	3	2	3	3	2	2	3	3
CO 2	3	3	1	3	3	3	3	3	3
CO 3	3	3	1	3	3	2	3	3	2
CO 4	3	3	2	3	3	3	3	3	3
CO 5	3	3	1	3	3	2	3	3	2

High – 3

Medium – 2

Low – 1

M.Com. (General)**First Year****Elective – II A****Semester I****BEHAVIOURAL FINANCE**

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	BEHAVIOURAL FINANCE		5	-	-	-	3	5	25	75	100

Learning Objectives	
1	To outline the concept of behavioural finance
2	To know the theories based on utility
3	To examine the role of behavioural factors and financial markets
4	To analyse behavioural corporate finance
5	To apply emotions and decision making

Course Units

UNIT I	(15 hrs)
Introduction to Behavioral finance: Nature, scope, objectives and application; Investment Decision Cycle: Judgment under Uncertainty: Cognitive information perception - Peculiarities (biases) of quantitative and numerical information perception - Representativeness – Anchoring - Exponential discounting - Hyperbolic discounting.	
UNIT II	(15 hrs)
Utility/ Preference Functions: Expected Utility Theory [EUT] and Rational Thought: Decision making under risk and uncertainty - Expected utility as a basis for decision-making – Theories based on Expected Utility Concept - Investor rationality and market efficiency.	
UNIT III	(15 hrs)
Behavioral Factors and Financial Markets: The Efficient Markets Hypothesis – Fundamental Information and Financial Markets - Information available for Market Participants and Market Efficiency -Market Predictability –The Concept of limits of	

Arbitrage Model - Asset management and behavioral factors - Active Portfolio Management: return statistics and sources of systematic underperformance. - Fundamental information and technical analysis – the case for psychological influence.

UNIT IV

(15 hrs)

Behavioral Corporate Finance: Behavioral factors and Corporate Decisions on Capital Structure and Dividend Policy - Capital Structure dependence on Market Timing -. Systematic approach to using behavioral factors in corporate decision making. External Factors and Investor Behavior: Mechanisms of the External Factor influence on risk perception and attitudes - Connection to human psycho physiology and emotional regulation Active portfolio management – the source of the systematic under performance.

UNIT V

(15 hrs)

Emotions and Decision – Making: Experimental measurement of risk-related - Measuring Risk - Emotional mechanisms in modulating risk-taking attitude - Neurophysiology of risk taking. Personality traits and risk attitudes in different domains.

Course outcomes:

Students will be able to:

CO No.	CO Statement	Knowledge level
CO 1	Discriminate between a behavioral finance perspective and a traditional finance perspective.	K1
CO 2	Measure the influence of behavioral biases on individual investment decision making.	K4
CO 3	Critically analyze the financial factors and asset management	K3
CO 4	Identify behavioral factors in corporate decision making	K2
CO 5	Develop a framework for investing in the financial markets that minimizes “irrational” behavior and maximizes risk adjusted returns.	K4

Books for reference:

- Behavioral Finance: Psychology, Decision-Making, and Markets", by Ackert and Deaves.
- Understanding Behavioral Finance by Ackert→ The Psychology of Investing by John R. Nofsinger, Pearson Prentice Hall, (4th Edition)
- What Investors Really Want - Learn the lessons of behavioral Finance, Meir Statman, McGraw-Hill
- Handbook of Behavioral Finance – Brian R. Bruce
- Behavioral finance - Wiley Finance - Joachim Goldberg, Rüdiger von Nitzsch
- Plous, Scott, 1993, The Psychology of Judgment and Decision Making, Ch 10-15
- Shleifer, Andrei, 2000, Are Financial Markets Efficient?, Chapter 1 in Inefficient Markets, Oxford University Press.
- Ackert, L., and R. Deaves, 2010, Behavioral Finance: Psychology, Decision-Making and Markets, South-Western Cengage Learning, Mason, Ohio.
- Nofsinger, J. R., 2001, Investment Madness, Prentice Hall.
- Mitchell, O. S., and S. P. Utkus, eds., 2004. Pension Design and Structure: New Lessons from Behavioral Finance (Oxford University Press, New York, New York).
- Montier, James (2002): Behavioural Finance, John Wiley & Sons, New York.
- Plous, S. (1993). The psychology of judgment and decision-making NY: McGrawHill.

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO 1	3	3	3	3	3	2	3	2	3
CO 2	3	3	3	3	3	2	3	2	3
CO 3	3	3	3	3	3	2	3	2	3
CO 4	3	3	3	3	3	2	3	2	3
CO 5	3	3	3	3	3	2	3	2	3

High – 3

Medium – 2

Low – 1

M.Com. (General)

First Year

Elective – II B

Semester II

EXPORT IMPORT PROCEDURES AND DOCUMENTATION

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	EXPORT IMPORT PROCEDURES AND DOCUMENTATION		5	-	-	-	3	5	25	75	100

Learning Objectives	
1	To analyse the aspects of preliminaries for Exports and Imports
2	To analyse Export Import Documentation
3	To apply Export-Import Procedure
4	To utilise Pre-Import Procedure
5	To apply Policy and Institutional Framework for Exports and Imports Foreign Trade Policy

Course Units

Unit I: Preliminaries for Exports and Imports:	15 hours
Meaning and Definition of Export – Classification – Strategy and Preparation for Export Marketing – Export Marketing Organizations – Registration Formalities – IEC – RCMC – Export Licensing – Selection of Export Product – Identification of Markets – Methods of Exporting – Pricing Quotations – Payment Terms – Letter of Credit Liberalization of Imports – Negative List for Imports – Categories of Importers –Special Schemes for Importers	
Unit II: Export Import Documentation:	15 hours
Aligned Documentation System – Commercial Invoice – Shipping Bill – Certificate of Origin – Consular Invoice – Mate’s Receipt – Bill of Lading – GR Form – ISO 9000 – Procedure for obtaining ISO 9000 – BIS 14000 Certification – Types of Marine Insurance	

Policies. Import Documents – Transport Documents – Bill to Entry – Certificate of Inspection – Certificate of Measurements – Freight Declaration.

Unit III: Export-Import Procedure: 15 hours

Steps in Export Procedure – Export Contract – Forward Cover – Export Finance – Institutional framework for Export Finance – Excise Clearance – Pre-shipment Inspection – Methods of Pre-shipment Inspection – Marine Insurance – Role of Clearing and Forwarding Agents – Shipping and Customs Formalities – Customs EDI System – Negotiation of Documents – Realisation of Exports Proceeds.

Unit IV: Policy and Institutional Framework for Exports and Imports: 15 hours

Foreign Trade Policy – Highlights – Special Focus Initiatives – Duty Drawback – Deemed Exports – ASIDE – MAI ; MDA – Star Export Houses – Town of Export Excellence – EPCG Scheme – Incentives for Exporters. Export Promotion Councils- Commodity Boards – FIEO – IIFT – EOUs – SEZs – ITPO – ECGC – EXIM Bank.

UNIT V: Pre-Import Procedure: 15 hours

Steps in Import Procedure – Legal Dimensions of Import Procedure – Customs Formalities for Imports – Warehousing of Imported goods – Exchange Control Provisions for Imports – Retirement of Export Documents.

Course Outcomes

Students will be able to

CO No.	CO Statement	Knowledge level
1	Explain Preliminaries for Exports and Imports	K2
2	Choose the appropriate technique for Export Import Documentation	K3
3	Make use of Export Import Documentation	K3
4	Choose Polices and Institutional Framework for Exports and Imports Foreign Trade Policy	K3
5	Construct Pre-Import Procedure	K3

Books for reference:

1. Handbook of Import-Export Procedures – Ministry of Commerce, -,
2. Government of India, New Delhi
3. Export: What, Where and How, Paras Ram, Anupam Publishers, Delhi
4. Exports – Do it Yourself, Mahajan M.I., Snow White Publications, New Delhi
5. Import – Do it Yourself, M. I. Mahajan, Snow White Publications, New Delhi
6. Export Marketing, TAS Balagopal , Himalaya Publishing House
7. Export Documentation and Procedures, , Nabhi Publications, New Delhi
8. International Marketing Management, R.L. Varshney, Sultan Chand
9. International Marketing, Terpstra, Holt Saunders
10. International Business, Concept, Environment and Strategy, Sharan V., –
11. Export Management, D.C. Kapoor, Vikas Publishing House

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	3	3	3	3	3
CO3	3	3	2	3	3	3	3	3	3
CO4	3	3	2	3	3	3	3	2	3
CO5	3	3	1	3	3	3	3	3	3

High – 3

Medium – 2

Low – 1

Semester II

Part	Course	Credits	Hours per Week
	Core IV - Strategic Cost Management	5	6
	Core V - Corporate Accounting	5	6
	Core VI - Setting up of Business Entities	4	6
	Elective III A - Business Ethics and Corporate Sustainability (or) III B- Digital Banking	3	4
	Elective IV A – Forensic Accounting (or) IV B - Logistics and Supply Chain Management	3	4
	Skill Enhancement Course (SEC) – I Advanced Excel	2	4
		22	30

M.Com. (General)**First Year****Elective – III A****Semester II****BUSINESS ETHICS AND CORPORATE SUSTAINABILITY**

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	BUSINESS ETHICS AND CORPORATE SUSTAINABILITY		4	-	-	-	3	4	25	75	100

Learning Objectives	
1.	To understand the concept and importance of business ethics
2.	To enable ethical decision making based on various theories
3.	To gain knowledge on moral issues relating to business, marketing, advertising, finance, HR and environmental protection
4.	To understand the concepts of corporate sustainability
5.	To analyze sustainability information and prepare reports

Course Units

<p>UNIT I (12 hrs)</p> <p>Introduction to Business Ethics</p> <p>Business Ethics- Meaning and Definition of Business Ethics - Nature of Business Ethics - Role and importance of Business Ethics and values in Business - Causes of unethical behaviour - Ethical issues.</p>
<p>UNIT II (12 hrs)</p> <p>Ethical Theories</p> <p>Ethical Decision Making -Decision Making (Normal Dilemmas and problems) - Application of Ethical Theories in Business - Traditional Ethical Theories - Utilitarianism, - Ethical Egoism - Ethics of Duties - Normative Theories of Business Ethics - Stakeholder Theory - Stockholder Theory - Lawrence Kohlberg's Theory Model Development.</p>
<p>Unit III (12 hrs)</p> <p>Moral Issues in Business</p> <p>Moral Issues in Business - Importance of moral issues and reasoning - Whistle Blowing- Kinds of Whistle Blowing - Ethical issues in functional areas of business.</p> <p>Marketing and Advertising - Truth in Advertising- Manipulation – Coercion-Trade Secrets- Corporate disclosure-Insider trading.</p> <p>Finance -Fairness' and efficiency in Financial Market – Greenmail-Golden Parachute.</p> <p>HR: Workers Rights and Duties - Work place Safety - Sexual Harassment-Equal Employment Opportunity- Preferential hiring.</p> <p>Environmental Protection - Safety and acceptable risk- Environmental Harm, Pollution and its Control– Product Safety and Corporate Liability.</p>
<p>UNIT IV (12 hrs)</p> <p>Corporate Sustainability</p> <p>Corporate Sustainability - Concepts of sustainability - Social, Environmental and Economic dimensions -Sustainability in a business context. Principles of Sustainable Development: History and emergence of the concept of Sustainable Development - Definitions, Environmental issues and crisis, Resource degradation, Greenhouse gases, Desertification, Social insecurity, Industrialization, Globalization and Environment.</p>

UNIT V**(12 hrs)****Sustainability Reporting**

Sustainability Reporting - Investors, customers, government and media- Disclosing sustainability information – report and website - Transparency and Accountability - One Report movement – Financial and non-financial together - Triple bottom line concept for Sustainable Business - Sustainability Reporting: Flavour of GRI, BRR, BRSR.

Course Out comes

Students will be able to:

CO No.	CO Statement	Knowledge level
CO 1	Apply the concepts of business ethics in practice	K3
CO 2	Demonstrate ethical decision making by applying various theories	K2
CO 3	Evaluate moral issues relating to business, marketing, advertising, finance, HR and environmental protection	K5
CO 4	Explain the concepts of corporate sustainability	K2
CO5	Construct reports disclosing sustainability information	K3

Books for study:

1. Muraleedharan K P and Satheesh E K (2021), “Fernando’s Business Ethics and Corporate Governance”, 3rd Edition., Pearson India Education Services Pvt. Ltd, Noida
2. John G. Cullen (2022), “Business, Ethics and Society: Key Concepts, Current Debates and Contemporary Innovations”, Sage Publications Pvt. Ltd, New Delhi
3. Khanka S S (2013), “Business Ethics and Corporate Governance (Principles and Practice)”, 1st Edition, S.Chand & Co. Ltd., New Delhi

Books for reference:

1. ICSI Study Material, “Governance, Risk Management, Compliances and Ethics”, New Delhi
2. David Chandler (2016), “Strategic Corporate Social Responsibility: Sustainable Value Creation”, 4th Edition., Sage Publications Pvt. Ltd, New Delhi
3. Mandal S K (2017), “Ethics in Business and Corporate Governance”, 2nd Edition., McGraw Hill Education, India

Web references:

1. <https://www.icsi.edu/media/website/BUSINESS%20MANAGEMENT%20ETHICS%20&%20ENTREPRENEURSHIP.pdf>
2. <https://ddceutkal.ac.in/Syllabus/BECG-MBA.pdf>
3. <https://sdgs.un.org/topics/desertification-land-degradation-and-drought>
4. https://sdgs.un.org/sites/default/files/documents/1387bp_ccInNSDS.pdf
5. <https://wedocs.unep.org/handle/20.500.11822/9435>

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	2	2	3	2	1	3
CO2	3	3	3	2	2	3	2	1	3
CO3	3	3	3	2	2	3	2	1	3
CO4	2	2	2	3	3	3	3	3	3
CO5	2	2	2	3	3	3	3	3	3

High – 3

Medium – 2

Low – 1

M.Com. (General)**First Year****Elective – III B****Semester II****DIGITAL BANKING**

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	DIGITAL BANKING		4	-	-	-	3	4	25	75	100

Learning Objectives	
1	To understand Banking Technology
2	To gain knowledge on Online Banking
3	To understand the Data Communication Network and EFT systems
4	To analyse Role of Technology Up gradation and its impact on Banks
5	To understand Security Considerations Risk Concern Areas

Course Unit

UNIT I	(12 hrs)
Banking Technology: Essentials of Bank computerization Computer Systems; LANs; WANs; UPS; Core Banking Payment Systems and Electronic Banking: ATMs; HWAK; PIN; Electromagnetic Cards; Electronic Banking; Signature Storage & Retrieval System; CTS; Note & Coin Counting Machines; Microfiche; NPC; RUPAY	
UNIT II	(12 hrs)
Online Banking : Online Enquiry and Update Facilities – Personal Identification Numbers and their use in conjunction with magnetic cards of both credit and debit cards, smart cards, signature storage and display by electronic means, cheque truncation, note and coin counting device	

UNIT III	(12 hrs)
Data Communication Network and EFT systems: Components & Modes of Transmission; Major Networks in India; Emerging Trends in Communication Networks for Banking; Evolution of EFT System; SWIFT; Automated Clearing Systems; Funds Transfer Systems; Recent Developments in India	
UNIT IV	(12 hrs)
Role of Technology Up gradation and its impact on Banks: Trends in Technology Developments; Role & Uses of Technology Up gradation; Global Trends; Impact of IT on Banks- Preventive Vigilance in Electronic Banking Phishing; Customer Education; Safety Checks; Precautions	
UNIT V	(12 hrs)
Security Considerations Risk Concern Areas; Types of Threats; Control Mechanism; Computer Audit; IS Security; IS Audit; Evaluation Requirements Overview of IT Act Gopalakrishna- Committee Recommendations	

Course Outcomes:**Students will be able to:**

CO No.	CO Statement	Knowledge Level
CO 1	Compare Banking Technology tools	K2
CO 2	Assess the provisions relating to Online Banking	K5
CO 3	Recall the basics of Data Communication Network and EFT systems	K1
CO 4	Explain the Role of Technology Up gradation and its impact on Banks	K2
CO 5	Examine Security Considerations Risk Concern Areas	K4

Books for reference:

1. D.M.Mithani - The anatomy of Indian banking.
2. Varshney and sundaram - Banking Theory, Law and Practice.
3. M.L. Tanna - Banking Law and Practice in India
4. N.S. Toor - Information Hand Book for Bankers.

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	3	3	3	3	3	3	3	2	3
CO2	3	3	3	3	3	3	3	2	3
CO3	3	3	3	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3	2	3
CO5	3	3	3	3	3	3	3	2	3

High – 3

Medium – 2

Low – 1

M.Com. (General)**First Year**

Elective – IV A

Semester II

FORENSIC ACCOUNTING

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	FORENSIC ACCOUNTING		4	-	-	-	3	4	25	75	100

Learning Objectives	
1.	To understand the concepts of Forensic Accounting.
2.	To understand the Financial Crime Investigation and Financial Statement Fraud
3.	To gain knowledge on Computer Aided Forensic Accounting
4.	To analyze the significance of forensic audit, stages of forensic audit and tools of forensic audit.
5.	To understand the categories of cyber law and global issues of cyber space.

Course Units

<p>UNIT I</p> <p>Introduction to Forensic Accounting</p> <p>Concepts, Meaning, role of forensic accountant, requisite for a successful forensic accountant, growth of forensic accounting, fraud, types of fraud, five accounting cycles.</p>	<p>(12 hrs)</p>
<p>UNIT II</p> <p>Financial Crime Investigation and Financial Statement Fraud</p> <p>Business as a victim, Employee theft, payroll fraud, management thefts, corporate thefts, Identity thefts, the investigative process, auditor's responsibility and law. Financial statement fraud -Improper revenue recognition, revenue recognition detective techniques, revenue and receivable misappropriation, assets misstatement- Inventory, Investment, understatements of liabilities and expenses</p>	<p>(12 hrs)</p>
<p>Unit III</p> <p>Computer Aided Forensic Accounting</p> <p>Data mining- benefits and pitfalls, effective data mining, assessing data quality and format, data cleaning, eliminating duplicate information, testing the data for completeness and accuracy, skills of the forensic technologies, role of data analysis in the investigation, data cleaning.</p>	<p>(12 hrs)</p>
<p>UNIT IV</p> <p>Forensic Audit</p> <p>Meaning of forensic audit - significance of forensic audit - stages of forensic audit, need for forensic audit - objectives of forensic audit - benefits of forensic audit - tools for forensic audit.</p>	<p>(12 hrs)</p>
<p>UNIT V</p> <p>Cyber Law</p> <p>Comments of cyber law, categories of cyber law, information technology Act-2000, international aspects of electronic contracting, global issues of cyber space.</p>	<p>(12 hrs)</p>

Reference:

1. Howard Silveston et. al; Forensic Accounting and Fraud Investigation for Non Experts; Wiley Publication
2. Bee Lean Chew; Forensic Accounting and Finance; Kogan page Limited
3. Saurav K Datta; Statistical Techniques for forensic accounting' e book time moore
4. Daniel Calinson Ashely; Forensic Accounting and Fraud Investigation; sultan publication
5. Sikandar Sultan; Forensic Accounting; SulthanPublcation

Course Outcomes

Students will be able to:

CO No.	CO Statement	Knowledge level
CO 1	To understand the conceptual framework of Forensic accounting.	K1
CO 2	To identify, analyze and interpret indicators of financial fraudulent activity	K4
CO 3	To identify, analyze and interpret indicators of investigation process and identify situations for their application	K3
CO 4	To understand the significance of forensic audit, stages of forensic audit and tools for forensic audit.	K3
CO5	To know the categories of cyber law, Information Technology Act-2000 and global issues of cyber space.	K2

Note: Latest edition of the books may be used

Mapping of course outcomes with POs and PSOs

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CO1	2	2	1	2	3	3	3	1	3
CO2	3	3	3	3	3	3	3	1	3
CO3	3	3	3	3	3	3	3	1	3
CO4	3	3	2	3	3	3	3	2	3
CO5	2	2	2	3	3	3	3	1	3

High – 3

Medium – 2

Low – 1

M.Com. (General)**First Year****Elective – IV B****Semester II****LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

Course Code	Title of the Course	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
	LOGISTICS AND SUPPLY CHAIN MANAGEMENT		4	-	-	-	3	4	25	75	100

Learning Objectives	
1.	To identify the primary differences between logistics and supply chain management
2.	To understand the individual processes of supply chain management and their interrelationships within individual companies and across the supply chain.
3.	To evaluate the management components of supply chain management
4.	To analyze the tools and techniques applied in implementing supply chain management.
5.	To create awareness about the professional opportunities in supply chain management.

Course Units

UNIT I	(12 hrs)
Supply Chain Management	
Supply Chain Management: Concept, Features, Evolution, Importance, Process and Barriers of Supply Chain Management – Principles, Supply Chain Strategies – Organizations, Coordination, Innovation and Forecasting - Supply chain intermediaries – Concept and Types, Channels of Distribution for Industrial Goods and Consumer Goods, Channels of Distribution at Services Level, Factors for selection of suitable channels.	

UNIT II	(12 hrs)
Global perspectives	
<p>Global perspectives: Measuring and analyzing the value and efficiency of Global Supply Chain Networks, Global market forces, Types of global supply chain -Indian Perspectives: Measuring and Analyzing the value and efficiency of Domestic Supply Chain Networks, Economic effects of supply chains - Customer Perspectives: Customer values, Role of customers and Ways of improving customer services in SCM.</p>	
UNIT III	(12 hrs)
Framework of Logistics	
<p>Logistics: Introduction – Positioning of Information in Logistics and Supply Chain Management – Logistics Information System (LIS) - Logistics Management: Concept and Process, Competitive Advantages and Three C’s, Changing Logistics Environment, Reverse Logistics, Importance of Inventory Control -Elements of inventory management – Inbound and out bound logistics, Bull- whip effect – distribution and warehousing management - Transport Functions and Participants in Transportation Decisions - Transport Infrastructure- Packaging and Materials Management: Consumer and Industrial Goods Packaging - Factors influencing Materials Planning, Preservation Safety and Measures of Materials Handling.</p>	
UNIT IV	(12 hrs)
SCM-Warehousing	
<p>Introduction– Concepts of Warehousing– Types of Warehouse – Functions of Warehousing– Strategic Warehousing, Warehouse Operations, Ownership Arrangements, Warehouse Decisions, Warehouse Management Systems, Packaging Perspectives, Packaging for Material Handling Efficiency, Materials Handling, Supply Chain Logistics Design: Global Strategic Positioning; Global SC Integration, SC Security, International Sourcing, Distribution control and evaluation.</p>	
UNIT V	(12 hrs)
SCM-Plan	
<p>SCM Plan: Demand Planning, Source of Procurement, Production or Assembly Steps, Sales return of defective or excess goods-Use of Internet in SCM: Role of computer/ IT in supply chain management –E- market places, E-procurement, E-logistics, E-fulfillment -Operative</p>	

Systems in SCM: Enterprise Resource Planning (ERP), Performance Modeling of supply chains using Markov chains, Inventory Control- Importance, Pareto's Law -Emerging Technologies in Logistics and Supply Chain Management: CRM Vs SCM, Benchmarking concept, Features and implementation, Outsourcing: Basic concepts, Value addition in SCM – Concept of demand chain management - Growth of Logistics and Supply Chain Management in national and international scenarios.

Course Outcomes

Students will be able to:

CO No.	CO Statement	Knowledge level
CO 1	Recall the concepts and features of SCM	K1
CO 2	Summarize global and Indian perspectives of SCM	K2
CO 3	Examine changing logistics environment pertaining to materials management, warehousing and distribution	K4
CO 4	Explain strategic warehousing for SCM	K2
CO5	Outline the role of internet in SCM	K2

Books for study:

1. Christopher Martin, "Logistics and Supply Chain Management" (2016) 5th Edition, FT Publishing International, India
2. Chopra, Sunil, Meindl, Peter and Kalra, D.V.; Supply Chain Management: Strategy, Planning and Operation; Pearson Education Pvt. Ltd, Noida

Books for reference:

1. Sahay, B.S., Supply Chain Management, 2nd Edition; Macmillan Publishers India
2. Ballou, R.H. Business Logistics Management. Prentice-Hall Inc.
3. Bowersox D.J., Closs D.J, Bixby Cooper. M., Supply Chain Logistics Management, (2002), 9th Edition, McGraw-Hill Higher Education, Noida

Web references:

1. <http://www.wisdomjobs.com/e-universit/production-and-operations-management-tutorial-295/principles-of-material-handling-9576.html>
2. <http://www.marketing91.com/logistics-activitiesw/>
3. <https://www.fcbo.com/services/warehouse-strategies>.
4. <https://cleartax.in/s/just-in-time-jit-inventory-management>

Note: Latest edition of the books may be used

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

**MASTER OF PHILOSOPHY – COMMERCE
For Affiliated Colleges (Full-Time) – CBCS**

(Revised Effective from the academic year 2018-2019 and thereafter)

OBJECTIVES

To Provide Exposure to emerging issues in the area of Commerce

To Undertake Research Problems on the Contemporary Issues with Social Relevance

To Persuade to Undertake Independent Projects and Consultancy

Scheme of Examination (Revised)

Sl.No	Semester	Subject	Credits	Hours / Week
1.	I	Core I – Research and Teaching Methodology	4	4
2.	I	Core II – Contemporary Functional Management	4	4
3.	I	Project Oriented Elective Course (Theory) – Professional Competencies	4	4
4.	II	Dissertation and Viva - Voce	12	-
		Total	24	-

PAPER-III
PROFESSIONAL COMPETENCIES

L T P C
4 0 0 4

Objectives:

- To enable the students acquire overall knowledge on Professional Competencies.
- To enable the students develop understanding on Professional Competencies.
- To enable the students apply the acquired knowledge Professional Competencies
- To enable the students develop skills of Professional Competencies.
- To enable the students to compete in the professional competitive examination.

Unit-I - Teaching Aptitude (12 L)

Teaching Aptitude- Modern methods of Teaching- Multimedia tools- Games and simulation relevant to the area of specialization

Unit-II - General Awareness (12 L)

General Awareness - Knowledge on Contemporary economic, social and Business issues- Reports on Industry and Trade analysis- People and Environment- Pollution and its impact on human life.

Unit-III – Communication (12 L)

Communication - Nature- Characteristics- types, barriers and effective classroom communication- Time Dynamics- visuals to improve verbs – Arts of Writing – Non verbal communication – word processing stations – Teleconferencing.

Unit-IV - Information Communication and Technology (12 L)

Information Communication and Technology - Concepts, advantages, disadvantages- using web as a tool of updating knowledge- Competency to download and save, ability to follow the right link.

Unit-V - Reasoning Aptitude (12 L)

Reasoning Aptitude - Number Series, letter series, codes; Relationships, Classification, understanding the structure of arguments- evaluating and distinguishing deductive, inductive reasoning.

Total: 60 L

References:

1. Arun Sharma, General Studies paper – II for civil services preliminary examination, McGraw Hill Education (india) Private Limited, New Delhi, 2016.
2. IBPS – Bank PO/MT/SO, CWA – VI , kiran institute of career excellence Pvt.Ltd., Delhi,2016.
3. Group –I, General Studies, sakthi’s publishing house, Chennai, 2017.
4. P.Subba Rao, Business Communication, Cengage learning India Pvt.Ltd.2012.
5. Mallika Nawal, Business Communication, , Cengage learning India Pvt.Ltd.2012

MANONMANIAM SUNDARANAR UNIVERSITY

DEPARTMENT OF COMMERCE

Ph.D - Course Work Papers

Sl.No	COURSE TITLE	CREDIT
1.	Teaching and Research methodology	4
2.	Human Resource Management	4
3.	Industrial relations and Labour Welfare	4
4.	Stress Management	4
5.	Training and Development	4
6.	Entrepreneurship Development	4
7.	Business Ethics and corporate Governance	4
8.	Banking theory Law and Practice	4
9.	Security Analysis and portfolio Management	4
10.	Merchant Banking and Financial services	4
11.	International Trade	4
12.	International Finance	4
13.	Financial Management	4
14.	Accounting for Financial decision making	4
15.	Indian Financial System	4
16.	Customer Relationship Management	4
17.	Marketing Management	4
18.	Supply chain Management	4
19.	Integrated Marketing Communication	4
20.	Rural Marketing	4
21.	International Marketing	4
22.	Consumer Behaviour	4
23.	Service Marketing	4
24.	Mini Project	4

Course Objectives :

- To develop understanding of the basic framework of research process.
- To understand the various research designs and techniques.
- To identify various sources of information for literature review, data collection, concept of research and its methodologies
- To organize and conduct research in a more appropriate manner to write research reports and theses.

UNIT – I INTRODUCTION

Meaning and Significance – the research process – Types of Research – Exploratory and causal Research – Theoretical and empirical Research – Cross –Sectional and time – series Research – Research questions / Problems – Research objectives – Research hypotheses – characteristics.

UNIT – II RESEARCH DESIGN AND MEASUREMENT

Research design – Definition – types of research design – exploratory and causal research design – Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument.

UNIT – III DATA COLLECTION

Types of data – Primary Vs Secondary data – Methods of primary data collection – Survey Vs Observation – Experiments – Construction of questionnaire and instrument – Validation of questionnaire – Sampling plan – Sample size – determinants optimal sample size – sampling techniques – Probability Vs Non–probability sampling methods.

UNIT – IV DATA PREPARATION AND REPORT WRITING

Data Preparation – editing – Coding –Data entry – Validity of data – Qualitative Vs Quantitative data analyses – Bivariate and Multivariate statistical techniques – Factor analysis – Discriminant analysis – cluster analysis – multiple regression and correlation – multidimensional scaling – Conjoint Analysis - Application of statistical software for data analysis - Research report – Different types – Contents of report

UNIT – V TEACHING METHODS

Teaching – Objectives of teaching, phases of Teaching – Teaching methods: lecture method, discussion method, discovery learning, Inquiry, Problem solving method, project method. Seminar- Integrating ICT in teaching: Individualised instruction, ways for effective presentation with power points, documentation - Evaluation; formative, summative & continuous and comprehensive Evaluation. Later Adolescent Psychology: meaning, physical, cognitive, emotional, Social and moral Development –Teaching later adolescents

REFERENCES:

- 01 Kothari C.R, *Research Methodology Methods and Techniques*, New Age International Publishers, 2015.
- 02 Saravanel . P, *Research Methodology*, Margham Publishers, Chennai, 2013.
- 03 Srivastava, Shenoy and Sharma: *Quantitative Techniques for Managerial Decision*: New Delhi.2016.

HUMAN RESOURCE MANAGEMENT

L	T	P	C
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Course Objectives :

- To make the participant understand the role of HR Department in an organization
- To know the various functional areas of Human Resource Management.
- To understand the recent developments in Human Resource Management.

UNIT – I INTRODUCTION

Introduction to HRM – Definition, Importance, Objective, Evolution of Concept, Changing Environment of HR, Labour legislation – meaning, Line and Staff Functions of HR. Strategic HR – Role in Strategy Formulation and Execution, Creating Strategy oriented HR System, HR Scorecard – Meaning, Information Requirements and Steps in Preparing Scorecard.

UNIT – II PROCUREMENT

Job Analysis – Meaning, Process and Methods, Human Resource Planning – Importance, Process, HR Demand and Supply Forecasting Techniques, Recruitment – Importance, Process and Sources, Selection – Process, Selection Test – Types and Validation Process, Interview Methods, Socialization – Importance and Types.

UNIT – III DEVELOPMENT

Training – Purpose, Process – Need Identification, Methods and Evaluation of Effectiveness, Executive Development Programmes – Difference from training, Common Practices, Performance Appraisal – Process, Techniques, MBO, 360 Degree Feedback. Career Development – Career Choices, Career Stages, Techniques. Talent Management – meaning, Process. Job Changes - Promotion, Demotion and Transfer.

UNIT – IV COMPENSATION AND INTEGRATION

Job Evaluation – Meaning, Process and Techniques, Compensation Plan – Deciding factors, Framing Process, Strategies, Variable Compensation and Employee Benefits. Human Needs – Motivation Theories, Employee Engagement, Leadership Theories and Quality of Work life. Grievances – Causes and Redressal methods.

UNIT – V MAINTENANCE AND SEPARATION

Safety – Safety Procedure and Safety Programme, Change management – Process, Nature , forces and Resistance Separation – Retirement, Layoff, Out-placement and Discharge HR Policies – Importance, Types, Process of Framing Policies, Human Resource Accounting & Audit – Meaning, Types, E-HRM – ERecruitment, E-Selection, E-Training and E-Compensation..

REFERENCES:

- 01 Dessler, “Human Resource Management”, (12th ed.), Pearson Education Limited, 2016.
- 02 Aswathappa K., “Human Resource and Personnel Management”, (8th ed.), Tata McGraw Hill, New Delhi, 2016
- 03 Decenzo and Robbins, “Human Resource Management”, (10th ed.), Wiley, 2010.
- 04 Mamoria C.B & Mamoria S., “Personnel Management”, Himalaya Publishing Co., 2016.
- 05 Snell and Scott, “Human Resource Management: A South Asian Perspective”, 1/e, Cengage Learning, India.

INDUSTRIAL RELATIONS AND LABOUR WELFARE

L	T	P	C
4	0	0	4

Course Objectives :

- To explore contemporary knowledge and gain a conceptual understanding of industrial relations.
- To understand the meaning of industrial relations, industrialization and organization structures.
- To examine the theoretical aspects, problems and issues in arbitration and bargaining
- To understand the various models of bargaining and arbitration. .

UNIT - I INDUSTRIAL RELATIONS

Concepts – Importance – Industrial Relations problems in the Public Sector – Growth of Trade Unions – Codes of conduct.

UNIT – II INDUSTRIAL CONFLICT

Disputes – Impact – Causes – Strikes – Prevention – Industrial Peace – Government Machinery – Conciliation – Arbitration – Adjudication.

UNIT - III LABOUR WELFARE

Concept – Objectives – Scope – Need – Voluntary Welfare Measures – Statutory Welfare Measures – Labour – Welfare Funds – Education and Training Schemes.

UNIT - IV INDUSTRIAL SAFETY

Causes of Accidents – Prevention – Safety Provisions – Industrial Health and Hygiene – Importance – Problems – Occupational Hazards – Diseases – Psychological problems – Counseling – Statutory Provisions.

UNIT - V WELFARE OF SPECIAL CATEGORIES OF LABOUR

Child Labour – Female Labour – Contract Labour – Construction Labour – Agricultural Labour – Differently abled Labour –BPO & KPO Labour - Social Assistance – Social Security – Implications

REFERENCES:

- 01 Mamoria C.B. and Sathish Mamoria, Dynamics of Industrial Relations, Himalaya Publishing House, New Delhi, 2014.
- 02 Arun Monappa, Ranjeet Nambudiri, Patturaja Selvaraj. Industrial relations & Labour Laws. Tata McGraw Hill. 2012
- 03 Ratna Sen, Industrial Relations in India, Shifting Paradigms, Macmillan India Ltd., New Delhi, 2012
- 04 Srivastava, Industrial Relations and Labour laws, Vikas Publications, 2016.

STRESS MANAGEMENT

L	T	P	C
4	0	0	4

Course Objectives :

- To provide a broad physical, social and psychological understanding of human stress.
- To present a broad background knowledge of stress management.
- To understand the management of work related stress at an individual and organizational level.
- To develop and implement effective strategies to prevent and manage stress at work.

UNIT - I UNDERSTANDING STRESS

Meaning – Symptoms – Works Related Stress – Individual Stress – Reducing Stress – Burnout.

UNIT – II COMMON STRESS FACTORS

Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks.

UNIT - III CRISIS MANAGEMENT

Implications – People issues – Environmental issues – Psychological fall outs – Learning to keep calm – Preventing interruptions – Controlling crisis – Importance of good communication – Taking advantage of crisis – Pushing new ideas – Empowerment.

UNIT - IV WORK PLACE HUMOUR

Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit – Using humour at work – Reducing conflicts with humour.

UNIT - V SELF DEVELOPMENT

Improving Personality – Leading with Integrity – Enhancing Creativity – Effective decision Making – Sensible Communication – The Listening Game – Managing Self – Meditation for peace – Yoga for Life.

REFERENCES:

- 01 Cooper, Managing Stress, Sage Publications, 2014
- 02 Waltschafer, Stress Management, 4th Edition 2009Tata McGraw Hill. 2012
- 03 Argyle. The Psychology of Happiness. Tata McGraw Hill. 2014
- 04 Bartlet. Stress – Perspectives & Process. Tata McGraw Hill. 2014
- 05 Juan R. Alascal, Brucata, Laurel Brucata, Daisy Chauhan. Stress Mastery. Pearson,2014

Course Objectives :

- To improve the participant's understanding of training needs
- To focus on assessment of training needs by assessing the existing skill sets of the employees
- To make aware of the various training programs as well as of knowledge of new training program.

UNIT - I INTRODUCTION

Training Concept: Definition, Meaning, Need for Training, Objectives of Training, Concept of Education, Role, Need and Importance of Training, Overview of Training Functions, Types of Training

UNIT – II TRAINING PROCESS

Process of Training: Steps In Training, Assessment of Training Needs (Person Analysis, Task Analysis, Organization Analysis), Scope of need assessment, Principles of Learning, Theories of Learning (Reinforcement Theory, Social Learning Theory, Andragogy), Learning Process

UNIT - III MANAGING TRAINING PROGRAMME

Designing and Implementing a Training Program: Transfer of Training, Training Design, Traditional Methods and Techniques of Training, Designing a Training Module (Cross Cultural, Leadership, Training the Trainer, Change), Management Development Program, Training Budget, Resistance to Training

UNIT - IV EVALUATION OF TRAINING

Evaluation of Training Program: Kirkpatrick Model of Evaluation, CIRO Model, Cost-Benefit Analysis, ROI of Training

UNIT - V TECHNOLOGY IN TRAINING

CBT, Multimedia Training, E-Learning / Online Learning, Distance Learning, New training methods, NLP, Various training instruments.

REFERENCES:

- 01 Lynton Rolf P and Pareek, Udai "Training for Development", (3rd ed.), Sage pub., 2012.
- 02 Noe, Raymond A and Kodwani , Amitabh Deo "Employee Training and Development", (5th ed.), Tata McGraw Hill New Delhi, 2014
- 03 Rothwell William J "Beyond Training and Development", Jaico, 2007
- 04 Phillips, Patricia Pulliam "ASTD Handbook for Measuring & Evaluating Training", (1st ed.), Cengage, 2012

ENTREPRENEURSHIP DEVELOPMENT

L T P C

Course Objectives :

4 0 0 4

- To develop and strengthen entrepreneurial quality among the students.
- To impart knowledge of basic entrepreneurial skills.
- To get practical knowledge to run a business efficiently and effectively. .

UNIT - I ENTREPRENEURIAL COMPETENCE

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful, Entrepreneur – Knowledge and Skills of Entrepreneur.

UNIT – II ENTREPRENEURIAL ENVIRONMENT

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organizational Services - Central and State Government Industrial Policies and Regulations - International Business

UNIT - III BUSINESS PLAN PREPARATION

Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Venture capital, IT startups

UNIT - IV LAUNCHING OF SMALL BUSINESS

Positioning of services – Designing service delivery System, Service Channel – Pricing of services, methods – Service marketing triangle - Integrated Service marketing communication

UNIT - V MANAGEMENT OF SMALL BUSINESS

Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units- Effective Management of small Business.

REFERENCES:

- 01 Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2014..
- 02 S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2016.
- 03 Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, Biztrantra ,4th Edition ,2014
- 04 Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, 2015.
- 05 P.Saravanel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai 2014.

BUSINESS ETHICS & CORPORATE GOVERNANCE

Course Objectives

- To enhance responsibility and accountability towards business and community through ethical practices.
- To recognize and resolve ethical issues in business.
- To grasp the current issues and implications of CSR on social development and progress
- To familiarize the students with the knowledge of emerging trends in good governance practices and corporate social responsibility in the global and Indian context.

UNIT I ENVIRONMENTAL ETHICS

Economic Environment - Philosophy of economic growth and its implications for business - Main features of Economic Planning with respect to business - Industrial policy and framework of government contract over Business - Role of chamber of commerce and confederation of Indian Industries.

UNIT II MANAGING ETHICAL DILEMMA

Characteristics - ethical decision making - ethical reasoning - the dilemma resolution process - ethical dilemmas in different business areas of finance – marketing - HRM, international business - Ethical culture in Organization - Developing codes of ethics and conduct - ethical and value based leadership - Indian Wisdom & Indian approaches towards business ethics.

UNIT – III CORPORATE SOCIAL RESPONSIBILITY

Introduction to CSR: Meaning & Definition of CSR - History & evolution of CSR. Concept of Charity - Corporate philanthropy -Corporate Citizenship - Concept of sustainability & Stakeholder Management - Relation between CSR and Corporate governance; environmental aspect of CSR; models of CSR in India

UNIT – IV CORPORATE GOVERNANCE

Meaning – need- scope- importance – benefits – role of corporate governance - corporate governance code - transparency & disclosure - role of auditors - board of directors and share holders - Global issues of governance - accounting and regulatory frame work - corporate scams - committees in India and abroad - Future of governance- innovative practices.

UNIT – V CORPORATE MANAGEMENT

Management vs. Governance; internal constituents of the corporate governance; key managerial personnel (KMP); chairman- qualities of a chairman - powers, responsibilities and duties of a chairman - chief executive officer (CEO) - role and responsibilities of the CEO - separation of roles of chairman and CEO; CFO; manager; company secretary; auditor.

REFERENCES:

- 01 Murthy C.S.V. Business Ethics and Corporate Governance, Himalaya Publishing, 2016 Edition
- 02 S K Mandal, Ethics in Business and Corporate Governance, Tata McGraw Hill, 2015
- 03 A.C. Fernando, Business Ethics: An Indian Perspective, Pearson, 2015
- 04 Riya Rupani, Business Ethics and Corporate Governance, Himalaya Publishing, 2017.

Course Objectives:

- To acquire specialized knowledge of law and practice relating to Banking.
- To understand Banking theory and to know about the banking innovations.
- To understand the conceptual and legal parameters including the judicial interpretation of banking law.
- To acquaint students with the banking technology and their recent developments.
- To enhance their knowledge on modern banking concepts and techniques.

UNIT- I STRUCTURE OF INDIAN BANKING BUSINESS

Banking Business Development and Evolution/Innovation in India - Investment policy and cash reserve ratio of commercial bank - Window dressing - KYC - Concepts of CAMELS in banking.

UNIT – II BRANCH OPERATION AND CORE BANKING

Introduction and evolution of bank management – Technological impact in banking operation – Total branch computerization – Concept of opportunities – Centralized banking – Concept, opportunities, challenges and implementation

UNIT –III REGULATORY FRAMEWORK AND COMPLIANCES

Reserve Bank of India Act, 1934 - Banking Regulation Act, 1949 - New Bank Licensing Policy, 2013 - Prevention of Money Laundering Act, 2002 (PMLA) - Banking Codes and Standards Board of India (BSCSBI)- The Banking Ombudsman Scheme - Bankers' Book Evidence Act, 1891- Recovery of Debts Due to Banks and Financial institutions Act, 1993 (DRT Act).

UNIT –IV INDIAN ELECTRONIC BANKING SYSTEM

Core banking solution - Telebanking - Mobile banking - Forms of E-banking - ATM - Credit card - Debit card - Smart card - Electronic Money – E- Cheques- Electronic Token - Electronic Purse - SWIFT - RTGS - NEFT – CHIPS – ECS –IFCS –CBS - Online IPOs - Green shoe option –international Payment System.

UNIT – V CONTEMPORARY ISSUES IN BANKING

Techniques Analysis of Rangarajan committee reports – E Banking budgeting – Banking software's - Future of Indian Banking.

REFERENCES:

01 P M Sundaram and P N Varshney, - Banking Law and Practice “,Sultan chand & Sons Publishing House,2016.

02 C Shekar, Lekshmy Shekar, - Banking theory and practice “,Vikas Publishing House Pvt Ltd.2016.

03 Vasant Desai - Bank Management “,Himalaya Publishing House”.2015.

04 E.Gordon & K. Natrajan, —*Banking Theory, Law & Practice*”, Himalaya Publishing House, Mumbai, 24th revised edition, 2015.

05 *Banking Theory and Practice*” by Dr. P.K. Srivastava, Himalaya Publishing House, Mumbai, 2015..

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

L T P C

Course Objectives :

4 0 0 4

- To Analyze and understand Economic, Industry and Company information.
- To apply fundamental and technical analysis for security valuation.
- To interpret the published information and value the share price movements.
- To understand the various alternatives available for investment and to measure risk and return.

UNIT – I INVESTMENT SETTING AND SECURITIES MARKETS

Financial and economic meaning of Investment – Characteristics and objectives of Investment – Types of Investment – Making a trade at market place: Primary and Secondary Markets - Methods of floating new issues Market - Regulation of primary market, Stock exchanges in India - Trading system in stock exchanges.

UNIT – II FUNDAMENTAL ANALYSIS

Economic Analysis – Economic forecasting and stock Investment Decisions – Forecasting techniques Industry Analysis : Industry classification, Industry life cycle – Company Analysis - Measuring Earnings – Forecasting Earnings – Applied Valuation Techniques – Graham and Dodds investor ratios.

UNIT – III TECHNICAL ANALYSIS

Fundamental Analysis Vs Technical Analysis – Charting methods – Market Indicators Trend – Trend reversals – Patterns - Moving Average – Exponential moving Average – Oscillators – Market Indicators – Efficient Market theory.

UNIT – IV PORTFOLIO MANAGEMENT AND SELECTION

Portfolio analysis and selection: Portfolio concept, Portfolio risk and return, Beta as a measure of risk, Calculation of Beta, Selection of Portfolio: Markowitz's theory, Single Index Model – Capital Asset Pricing model – Arbitrage pricing theory.

UNIT – V PORTFOLIO MANAGEMENT AND PERFORMANCE EVALUATION

Portfolio management and performance evaluation: Performance evaluation of Existing Portfolio, Sharpe and Trynor measures; Finding alternatives and revision of portfolio.

REFERENCES:

- 01 Donald E.Fischer & Ronald J.Jordan, Security Analysis & Portfolio Management, PHI Learning., New Delhi, 8th edition, 2014.
- 02 Prasannachandra, Investment analysis and Portfolio Management, Tata McGraw Hill, 2014.
- 03 V.A.Avadhan, Securities Analysis and Portfolio Management, Himalaya Publishing House, 2016.
- 04 Preeti Singh, Investment Management, Himalaya Publishing House, 2016.
- 05 Punithavathy Pandian, Securities Analysis and Portfolio Management, Himalaya Publishing House, 2015.

MERCHANT BANKING AND FINANCIAL SERVICES

L T P C

Course Objectives :

4 0 0 4

- To outline the linkage between Merchant Banking, Retail Banking and central banking.
- To expose the important legislations affecting merchant banking activities.
- To identify the various segments of merchant banking industry.
- To identify the scope and opportunities in the field of Foreign Exchange and Investments.

UNIT – I INTRODUCTION OF FINANCIAL SYSTEM

Indian Financial System – Merchant Banking in India – Recent Developments and Challenges ahead – Functions of Merchant Bank Legal and Regulatory Framework – Relevant Provisions of Companies Act - Securities Contract Regulation Act, 1956 - SEBI Act,1992 – SEBI Guidelines relating to Investor Protection - Relation with Stock Exchanges and OTCEI.

UNIT – II NEW ISSUES MANAGEMENT

Role of Merchant Banker in Appraisal of Projects, Designing Capital Structure and Instruments – Issue Pricing – Book Building – Preparation of Prospectus Selection of Bankers, Advertising Consultants, etc. - Role of Registrars –Bankers to the Issue, Underwriters, and Brokers. – Offer for Sale.

UNIT – III MERGERS AND ACQUISITIONS

Mergers and Acquisitions – Portfolio Management Services – Credit Syndication -- Credit Rating – Meaning, Significance Agencies, National & International - Business Valuation

UNIT- IV LEASING AND HIRE PURCHASING

Leasing and Hire Purchasing – Hire Purchase act, 1972 - Financial Evaluation - Factoring and Forfeiting – Venture Capital.

UNIT- V FOREX SERVICES

Forex Services - Related Regulations - RBI Guidelines – FDI Policy 2013 - FII – SEBI Guidelines relating to FII, Mutual Funds – Organisation, types & Objectives , SEBI guidelines relating to Mutual Funds - Foreign Pension Funds – Investment Banking.

REFERENCES:

- 01 S.Gurusamy,"Merchant Banking & Financial Services", (2nd ed.),Tata McGraw Hill Publications, 2014.
- 02 M.Y.Khan, "Financial Services", (11th ed.), Tata McGraw-Hill, 2014. .
- 03 Nalini Prava Tripathy, "Financial Services", PHI Learning, 2014.
- 04 Varshney P.N. "Indian Financial System", Sultan Chand & Sons, New,Delhi.

INTERNATIONAL TRADE FINANCE

L	T	P	C
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Course Objectives :

- To describe the importance of balance of trade, balance of payment and various international commercial terms to the development of macroeconomic policy
- To evaluate the foreign exchange rate and the risk reduction strategies of Forex To Describe and distinguish among alternative trade documents of both export and import
- To Highlight the Indian government's export promotion schemes.

UNIT- I INTERNATIONAL TRADE

International Trade – Meaning and Benefits – Basis of International Trade – Foreign Trade and Economic Growth – Balance of Trade – Balance of Payment – Current Trends in India – Barriers to International Trade – WTO – Indian EXIM Policy.

UNIT- II EXPORT AND IMPORT FINANCE

Special need for Finance in International Trade – INCO Terms (FOB, CIF, etc.,) – Payment Terms – Letters of Credit – Pre Shipment and Post Shipment Finance – Forfeiting – Deferred Payment Terms – EXIM Bank – ECGC and its schemes – Import Licensing – Financing methods for import of Capital goods.

UNIT-III FOREX MANAGEMENT

Foreign Exchange Markets – Spot Prices and Forward Prices – Factors influencing Exchange rates – The effects of Exchange rates in Foreign Trade – Tools for hedging against Exchange rate variations – Forward, Futures and Currency options – FEMA – Determination of Foreign Exchange rate and Forecasting.

UNIT-IV DOCUMENTATION IN INTERNATIONAL TRADE

Export Trade Documents: Financial Documents – Bill of Exchange- Type- Commercial Documents - Proforma, Commercial, Consular, Customs, Legalized Invoice, Certificate of Origin Certificate Value, Packing List, Weight Certificate, Certificate of Analysis and Quality, Certificate of Inspection, Health certificate. Transport Documents - Bill of Lading, Airway Bill, Postal Receipt, Multimodal Transport Document. Risk Covering Document: Insurance Policy, Insurance Cover Note. Official Document: Export Declaration Forms, GR Form, PP Form, COD Form, Softer Forms, Export Certification, GSPS – UPCDC Norms.

UNIT- V EXPORT PROMOTION SCHEMES

Government Organizations Promoting Exports – Export Incentives : Duty Exemption – IT Concession – Marketing Assistance – EPCG, DEPB – Advance License – Other efforts I Export Promotion – EPZ – EQU – SEZ and Export House.

REFERENCES:

- 01 Apte P.G., International Financial Management, Tata McGraw Hill, 2014.
- 02 Jeff Madura, International Corporate Finance, Cengage Learning, 9th Edition, 2014.
- 03 Alan C. Shapiro, Multinational Financial Management, PHI Learning, 5th Edition, 2016.
- 04 Eun and Resnik, International Financial Management, Tata McGraw Hill, 5th Edition, 2015.
- 05 Website of Indian Government on EXIM policy.

INTERNATIONAL FINANCE

L	T	P	C
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Course Objectives :

- To get an insight of the International Monetary and Financial System.
- To know about Balance of payments and its components.
- To get an basic idea about calculation of Foreign Exchange Rates and Risks.
- To understand the factors influencing the Foreign Exchange rates

UNIT- I INTERNATIONAL MONETARY AND FINANCIAL SYSTEM

International Monetary and Financial System: Importance of international finance; Bretton woods conference and afterwards, IMF and the World Bank; European monetary system – meaning and scope

UNIT- II BALANCE OF PAYMENTS AND ITS COMPONENTS

Balance of Payment and International Linkages: Balance of payments and its components; International flow of goods, services and capital; Coping with current account deficit.

UNIT- III INTERNATIONAL FINANCIAL MARKETS AND INSTRUMENTS

International Financial Markets and Instruments: International capital and money markets; Money and capital market instruments; Salient features of different international markets; Arbitrage opportunities; Integration of markets; Role of financial intermediaries.

UNIT- IV FOREIGN EXCHANGE MARKETS

Foreign Exchange Markets: determining exchange rates; fixed and flexible exchange rate system; exchange rate theories; participants in the foreign exchange markets; foreign exchange markets – cash and spot markets; Exchange rate quotes; LERMS; Factors affecting exchange rates – spot rates, forward exchange rates, forward exchange contracts; Foreign exchange and currency futures; Exchange rate arrangement in India ; Exchange dealings and currency possession; Information and communication; Foreign exchange trades

UNIT - V FOREIGN EXCHANGE RISK

Foreign Exchange Risk: Transaction exposure, translation exposure and economic exposure; Management of exposure – internal techniques, netting, marketing, leading and lagging, pricing policy, assets and liability management and techniques.

REFERENCES:

- 01 Apte P.G., International Financial Management, Tata McGraw Hill, 2014.
- 02 Eitman, D.K. and A.I Stenehill : Multinational Business Cash Finance, Addison Wesley, New York. 2016
- 03 Henning, C.N., W Piggot and W.H Scott: International Financial Management, McGraw Hill, International Edition. 2016..
- 04 Levi, Maurice D : International Finance, McGraw – Hill, International Edition. 2014, 2015.
- 05 Rodriquefe, R.M. and E.E.Carter: International Financial Management, Prentice Hall, International Edition.2016
- 06 Yadav, SurendraS, P.K Jain and Max Peyrard: Foreign Exchange Markets, Macmillan, New Delhi. 2012.

Course Objectives:

- To understand the theoretical framework of financial management in business corporations.
- To understand the goals of the finance manager.
- To help the students gain a detailed account of various financial functions of business organizations.
- To understand and to apply financial concepts and principles in overall management..

UNIT –I COST OF CAPITAL

Factors affecting cost of capital - Methods of computation of cost of capital - Methods of Ranking investment proposal - Capital structure - Theories of capital structure.

UNIT –II PORTFOLIO MANAGEMENT

Portfolio theory - Reducing risk through diversification - Investment preference Factors contributing to M&A and M&A Wave - Synergies of M&A - Managing M&A.

UNIT – III MANAGEMENT OF CASH AND MARKETABLE SECURITIES

Motives for Holding Cash; Objectives of Cash Management; Factors Determining Cash Needs; Basic Strategies of Cash Management; Cash Management Techniques / Processes; Marketable Securities; and Cash Management Practices in India.

UNIT – IV CORPORATE RESTRUCTURING

Conceptual Framework - Financial Framework - Tax Aspect of Amalgamation -Merger and Demergers - Legal and Procedural Aspects of Mergers/Amalgamations and Acquisition/Takeovers - and other forms of Corporate Restructuring.

UNIT – V FINANCIAL MANAGEMENT OF PUBLIC SECTOR UNDERTAKINGS (PSUS)

Peculiarities of PSUs with Focus on Accounting and Finance - Financial Decisions in PSUs - Memorandum of Understanding (MoU) in PSUs - and Disinvestment in Public Sector Enterprises.

REFERENCES:

- 01 Kishore M Ravi, Strategic Financial Management, Taxmann Publication Pvt. Ltd. New Delhi,2015.
- 02 Dhamija Sanjay and Van Horne J.C, Financial Management and Policy, 12th Edition, Pearson Education, 2016
- 03 Pandey I. M, Financial Management, Vikas Publishing House, New Delhi, 2016.
- 04 Khan M Y, and Jain P. K, Financial Management: Text, Problems & Cases,Tata McGraw Hill,Education Private Limited., 2015.
- 05 Fundamentals of Financial Management -", J. Srinivasan P. Periasamy."2016.

ACCOUNTING FOR FINANCIAL DECISION MAKING

Course Objectives:

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4	0	0	4

- To attain Sustainable Knowledge with decision making in financial related issues.
- To develop a critical understanding of financial tools and techniques.
- To understand both the theoretical and practical role of financial management in business corporations.
- To have a greater appreciation and understanding of the importance of risk within the context of financial decision making.

UNIT – I FINANCIAL PLANNING AND STRATEGY

Strategy decision making and planning for Sustainable growth -Risk appraisal methods - Balancing risk and return - Portfolio theory and asset pricing models -

UNIT – II BETA ESTIMATION AND THE COST OF EQUITY

CAPM and the opportunity cost of equity capital - Options and their valuations - Binomial model for option valuation - Financial ratio analysis - Trading Legitimacy.

UNIT – III CAPITAL BUDGETING DECISIONS

Investment decision - investment evaluation criteria -Accounting rate of return - Net Present Value - Internal Rate of Return - Profitability Index - Discounting Payback

UNIT – IV CAPITAL STRUCTURE DECISION

Capital structure & market value of a firm. Theories of capital structure – NI approach, NOI approach, Modigliani Miller approach, traditional approach. Arbitrage process in capital structure - Planning the capital structure: EBIT and EPS analysis. ROI & ROE analysis. Capital structure policy.

UNIT – V WORKING CAPITAL CYCLE

Interpretation of working capital ratios - Capital structure Planning and Policy - Trade-off theory - Pecking Order theory - Flow-to-Equity Approach - Adjusted Present value (WACC and Miles-Ezzel).

REFERENCES

01 Khan M.Y and Pillai P.K, “Financial Management”, Tata Mc Graw Hill Publishing Company Ltd, New Delhi, Edition 2016.

02 Palanivelu V.R “Financial Management”, S.Chand Publishing House, New Delhi, Edition 2016.

03 I M Pandey, “Financial Management” , Vikas Publishing House Pvt.Ltd., New Delhi, Edition 2017.

04 Pearson, “Financial Management and Policy”, James C.Van Horne and Sanjay Dhamija , Dorling Kindersley (india) Pvt.Ltd.2015.

05 Chandra, Prasanna: Financial Management; Tata McGraw Hill, New Delhi, 2008.

Course Objectives:

- To have a Bird's view of the Indian Financial System and in Global Indian Banking System.
- To provide conceptual understanding and in-depth knowledge of securities markets in India
- To understand the structure of financial markets and institutions.
- To equip the students with the knowledge of sources of the funds and also of investing the funds.

UNIT – I FINANCIAL MARKETS

Money and capital markets - Money market – meaning, constituents, participants – functions. Money market instruments – call money, treasury bills, certificate of deposit, commercial bills, trade bills, commercial paper, recent trends in Indian money market; capital market – primary and secondary markets; capital market instruments.

UNIT – II SECURITIES MARKET

Financial Market – Segments – Types — Participants in financial Market – Regulatory Environment, Primary Market – Methods of floating new issues, Book building – Role of primary market – Regulation of primary market, Stock exchanges in India – BSE, OTCEI , NSE, ISE, and Regulations of stock exchanges – Trading system in stock exchanges –systematic and unsystematic risk – SEBI – money market – Debt market.

UNIT III FOREIGN EXCHANGE MARKET

Foreign Exchange Markets – Spot Prices and Forward Prices – Factors influencing Exchange rates – The effects of Exchange rates in Foreign Trade – Tools for hedging against Exchange rate variations – Forward, Futures and Currency options – FEMA – Determination of Foreign Exchange rate and Forecasting.

UNIT IV DERIVATIVES MARKET

Derivatives – Definition – Types – Forward Contracts – Futures Contracts – Options – Swaps – Differences between Cash and Future Markets – Types of Traders – OTC and Exchange Traded Securities – Types of Settlement – Uses and Advantages of Derivatives – Risks in Derivatives – Derivatives market in India.

UNIT – V MARKET PARTICIPANTS & PUBLIC ISSUES

Depository – role and functions – Depository participants' issuers and registrars (RTs) – Role of FIIs, and Investment Bankers – New public issue - book building process – IPOs, FPOs – Private placement QIP, QIBs, offer for sale – grading of new issues – content of offer document.

REFERENCES:

- 01 Padmalatha Suresh and Justin Paul, —Management of Banking and Financial Services, Pearson, Delhi, 2016.
- 02 Prasannachandra, Investment analysis and Portfolio Management, Tata McGraw Hill, 6th edition 2017.
- 03 Keith Redhead, 'Financial Derivatives – An Introduction to Futures, Forwards, Options and SWAPs', – PHI Learning, 2011.
- 04 Jeff Madura, International Corporate Finance, Cengage Learning, 9th Edition, 2011.
- 05 M.Y Khan, Indian Financial System, Tata McGraw Hill, 6th Edition, 2011

Course Objectives

- To impart skill based knowledge of Customer Relationship Management.
- To understand the concepts and principles of CRM.
- To understand the need and importance of maintaining a good customer relationship.
- To gain knowledge of strategic customer acquisition and retention techniques in CRM.
- To recognize the basic technological infrastructure and organizations involved in current and emerging CRM practices.

UNIT I UNDERSTANDING CUSTOMERS

Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behaviour in relationship perspectives; individual and group customer's - Customer life time value – Selection of Profitable customer segments.

UNIT II CRM STRUCTURES

Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications.

UNIT III CRM PLANNING AND IMPLEMENTATION

Strategic CRM planning process – Implementation issues – CRM Tools- Analytical CRM – Operational CRM – Call centre management – Role of CRM Managers - CRM Implementation Road Map- Developing a Relationship Orientation - Customer-centric Marketing and Processes - customer retention plans

UNIT – IV SERVICE QUALITY

Concept of Quality - Meaning and Definition of Service Quality - Factors influencing customer expectation and perception - Types of Service Quality - Service Quality Dimensions - Service Quality Gaps - Measuring Service Quality - Service Quality measurement Scales.

UNIT V TRENDS IN CRM

e- CRM Solutions – Data Warehousing – Data mining for CRM – an introduction to CRM software packages - The Technological Revolution: Relationship Management – Changing Corporate Cultures.

REFERENCES

- 01 G.Shainesh, Jagdish, N.Sheth, Customer Relationships Management Strategic Perspective, Macmillan 2015.
- 02 Alok Kumar et al, Customer Relationship Management : Concepts and applications, Biztantra, 2015.
- 03 H.Peeru Mohamed and A.Sahadevan, Customer Relation Management, Vikas Publishing 2017.
- 04 Jim Catheart, The Eight Competencies of Relationship selling, Macmillan India, 2016.
- 05 Zikmund. Customer Relationship Management, Wiley 2012 .

MARKETING MANAGEMENT

L T P C
4 0 0 4

Course Objectives:

- To study the strategies for developing new products and services that are consistent with evolving market needs.
- To evaluate the viability of marketing a product or service in an international market or markets.
- To know the contemporary issues in marketing.
- To understand the concept of green marketing.

UNIT-I STRATEGIC MARKETING PLANNING

Market Analysis and Selection: Marketing environment – macro and micro components and their impact on marketing decisions; Market segmentation and positioning; Buyer behaviour; consumer versus organizational buyers; Consumer decision making process.

UNIT-II MARKETING RESEARCH

Meaning and scope of marketing research; Marketing research process. Marketing Organisation and Control: Organising and controlling marketing operations. - Understanding the Marketing-Information Systems (MIS)- Introduction, - Characteristics of MIS- Benefits – Types – Components of Marketing Research.

UNIT – III CRM AND OTHER CONTEMPORARY ISSUES

Introduction - Relationship Marketing Vs. Relationship Management - Definitions of Customer Relationship Management (CRM) - Forms of Relationship Management - Managing Customer Loyalty and Development - Reasons Behind Losing Customers by Organisations - Significance of Customer Relationship Management - Social Actions Affecting Buyer-Seller Relationships - Rural Marketing - Services Marketing - E-Marketing or Online Marketing - cyber marketing.

UNIT – IV INTERNATIONAL MARKETING MANAGEMENT

Introduction - Nature of International Marketing - International Marketing Concept - International Market Entry Strategies - Approaches to International Marketing - International Product Policy - International Promotions Policy - International Branding - Country of Origin Effects - International Pricing.

UNIT – V GREEN MARKETING

Green marketing concept Eco-friendly marketing - principles and challenges of green marketing - Environmentalism concepts - problems in green marketing - green marketing strategies - Stakeholders of green marketing

REFERENCES:

- 01 Philip Kotler , Kevin Lane Keller — Marketing Managementll 15th Edition, Person Publications Limited, 2017.
- 02 Noel Capon and Siddharth Shekar Singh, ll managing Marketing–An Applied Approachll, Wiley India Pvt Limited 2017.
- 03 Kenneth E.Clow. Donald Baack, —cases in marketing management, ll 5 th edition, Person India Ltd, 2014.
- 04 Arunkumar and Meenakshi, —Marketing Management, ll Vikas Publishing House, 2015.

SUPPLY CHAIN MANAGEMENT

L T P C
4 0 0 4

Course Objectives :

- To create awareness on the functions of Supply Chain Management and to lay down the path to enter the supply chain business.
- To facilitate the development of skills for practical problem solving approach to complex areas of supply chain management.
- To learn various issues related to demand, inventory and supply management along with practical implementation.
- To appraise the recent trends, design and redesign of a supply chain Network as key components of an organization's strategic plan.

UNIT – I INTRODUCTION OF SUPPLY CHAIN MANAGEMENT

Supply Chain – Fundamentals –Evolution- Role in Economy - Importance - Decision Phases - Supplier- Manufacturer-Customer chain. - Enablers/ Drivers of Supply Chain Performance - Supply chain strategy - Supply Chain Performance Measures.

UNIT – II STRATEGICSOURCING

Outsourcing – Make Vs buy - Identifying core processes - Market Vs Hierarchy - Make Vs buy continuum -Sourcing strategy - Supplier Selection and Contract Negotiation - Creating a world class supply base- Supplier Development - World Wide Sourcing

UNIT – III SUPPLY CHAIN NETWORK

Distribution Network Design – Role - Factors Influencing Options, Value Addition – Distribution Strategies - Models for Facility Location and Capacity allocation. Distribution Center Location Models Supply Chain Network optimization models Impact of uncertainty on Network Design - Network Design decisions using Decision trees.

UNIT – IV PLANNING DEMAND, INVENTORY AND SUPPLY

Managing supply chain cycle inventory Uncertainty in the supply chain – Analysing impact of supply chain redesign on the inventory - Risk Pooling - Managing inventory for short life – cycle products -multiple item -multiple location inventory management - Pricing and Revenue Management

UNIT – V CURRENT TRENDS

Supply Chain Integration - Building partnership and trust in SC Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain - SC Restructuring - SC Mapping - SC process restructuring, Postpone the point of differentiation – IT in Supply Chain - Agile Supply Chains -Reverse Supply chain. Agro Supply Chains

REFERENCES:

- 01 Janat Shah, Supply Chain Management – Text and Cases, Pearson Education,2016.
- 02 Sunil Chopra and Peter Meindl, Supply Chain Management-Strategy Planning and Operation, PHI Learning / Pearson Education, 2016.
- 03 Sunil Chopra and Peter Meindl, Supply Chain Management-Strategy Planning and Operation, PHI Learning / Pearson Education, 2016
- 04 David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, Designing and Managing the Supply Chain: Concepts, Strategies, and Cases, Tata McGraw-Hill, 2014
- 05 Altekar Rahul V, Supply Chain Management-Concept and Cases, PHI, 20142.

INTEGRATED MARKETING COMMUNICATION

L T P C
4 0 0 4

Course Objectives :

- To get an insight of the importance of advertising and sales promotion campaigns in relation to consumer decision making processes.
- To draft oral and written integrated marketing communications plan based on primary and secondary research.
- To ensure a substantive assessment of corporate strengths, weaknesses, opportunities and threats (SWOT analysis) and create a substantive research plan for one's project.
- To construct IMC creative strategies and tactics, including digital & social media executions, advertising, promotions, and public relations initiatives.

UNIT – I INTRODUCTION TO ADVERTISEMENT

Concept – Definition-scope – Objectives-functions – principles of advertisement – Social, Economic and Legal Implications of advertisements – setting advertisement objectives – Advertisement Agencies – Selection and remuneration – Advertisement campaigns.

UNIT – II ADVERTISEMENT MEDIA

Media plan – Type and choice criteria – Reach and frequency of advertisements – Cost of advertisements – related to sales – Media strategy and scheduling design and execution of advertisements – Message development – Different types of advertisements – Layout – Design appeal – Copy structure – Advertisement production – Print – Radio. T.V. and Web advertisements.

UNIT – III SALES PROMOTION

Scope and role of sale promotion – Definition – Objectives of sales promotion – sales promotion techniques – Trade oriented and consumer oriented. Sales promotion – Requirement identification – Designing of sales promotion campaign – Involvement of salesmen and dealers – Out sourcing sales promotion national and international promotion strategies.

UNIT – IV PUBLIC RELATIONS

Introduction – Meaning – Objectives –Scope-Functions-integrating PR in to Promotional Mix-Marketing Public Relation function- Process of Public Relations-advantages and disadvantages of PR-Measuring the Effectiveness of PR- PR tools and techniques. PR and Media Relations, - PR consultancy: Pros and Cons.

UNIT – V PUBLICITY

Introduction – Meaning – Objectives – Tools – Goals of Publicity – Scope of Publicity – Importance of Publicity – Difference between Marketing, PR and Publicity – Social publicity – Web Publicity and Social media – Publicity Campaigns

REFERENCES:

- 01 George E Belch and Michel A Belch, Advertising & Promotion, Tata McGraw Hill, 7th edition, 2016.
- 02 S. H. H. Kazmi and Satish K Batra, Advertising & Sales Promotion, Excel Books, New Delhi, 2014.
- 03 Julian Cummings, Sales Promotion, Kogan Page, London 2015.
- 04 Jaishri Jefhwaney, Advertising Management, Oxford, 2014

L T P C

RURAL MARKETING

Course Objectives :

4 0 0 4

- To gain insight into the socio-economic structure of rural India.
- To explore the various facets of rural marketing and to develop an insight into rural marketing regarding different concepts and basic practices in this area.
- To understand the buying behaviour, the consuming pattern, the needs and wants of the rural consumer.
- To understand the concept and methodology for conducting the research in rural markets.

UNIT – I OVERVIEW OF RURAL MARKETING

Introduction of Rural marketing –Evolution of Rural Marketing in Indian and Global Context- Definition- Nature –Scope-Characteristics and potential of Rural Marketing - Importance of Rural Marketing- Socio-Cultural-economic & other environmental factors affecting in Rural Marketing- Emerging challenges & Opportunities in Rural Marketing.

UNIT – II RURAL MARKETS & DECISION

Profile of Rural Marketing Dimensions & Consumer Profile- Rural Market Equilibrium- Classification of Rural Marketing – Regulated- Non Regulated Marketing Mix- Segmentation- Targeting- Position- Rural Marketing Strategies- Role of Central, State Government and other Institutions in Rural Marketing Integrated Marketing Communication in Rural Marketing.

UNIT – III PRODUCT & DISTRIBUTION

Product / Service Classification in Rural Marketing - New Product Development in Rural Marketing- Brand Management in Rural Marketing- Rural Distribution in channel management- Managing Physical distribution in Rural Marketing- Fostering Creativity& Innovation in Rural Marketing- Sales force Management in Rural Marketing.

UNIT – IV RURAL CONSUMER BEHAVIOUR IN MARKETING RESEARCH

Consumer Buyer Behaviour Model in Rural Marketing- Rural Marketing Research-Retail &IT models in Rural Marketing-CSR and Marketing Ethics in Rural Marketing- Source of Financing and credit agencies- Consumer Education & Consumer Methods in Promotion of Rural Marketing- Advertisement & Media Role in Rural Marketing Promotion Methods.

UNIT – V TRENDS IN RURAL MARKETING

e- Rural Marketing-CRM &e-CRM in Rural Marketing- Advanced Practices in Rural Marketing- Social Marketing-Network Marketing- Green Marketing in Indian and Global Context-Co-operative Marketing- Micro Credit Marketing- Public Private Partnership Model in Rural Marketing- Advancement of Technology in Rural Marketing- Structure of Competition in Rural India.

REFERENCES:

- 01 Rural Marketing – C G Krishnamacharyulu, Lalitha Ramakrishnan – Pearson Education,2016.
- 02 Rural Marketing: Indian Perspective by Awadhesh Kumar Singh Satyaprakash pandey, New age publishers, 2014.
- 03 New Perspectives on Rural Marketing: Includes Agricultural Marketing By Ramkishen Y., 2016.
- 04 Rural Marketing, Pradeep Kashyap & Siddhartha Raut, Biztantra Publications, 2016.

INTERNATIONAL MARKETING

L	T	P	C
4	0	0	4

Course Objectives :

- To gain knowledge of basic elements of International Marketing.
- To know the Marketing environment in the context of Globalisation.
- To understand the Policy Framework and Procedural Aspects of International Marketing.

UNIT- I INTRODUCTION OF INTERNATIONAL MARKETING

International markets – Definition – Basic modes of entry – Nature of International Marketing- Benefits of International Marketing— International Marketing Task – World Trade – India’s Foreign Trade – Characteristics of MNCs - Global and Domestic marketing - International Product Life cycle – EPRG Framework - Institutional set up – Advisory bodies – Commodity organizations – Service Institutions – Government participation in Foreign Trade

UNIT- II INTERNATIONAL MARKETING ENVIRONMENT

Business culture around the world- language, customs, attitudes - marketing strategy adjustments - product adaptations. Geographic Description of Market – Political risk – Political Environment - Import quotas – tariffs - customs restrictions - required licenses – registrations – permits. Development and scope of International law – INCOTERMS – WTO – GATT

UNIT- III POLICY FRAMEWORK AND PROCEDURAL ASPECTS

India’s Export – Import policy – EXIM Policy – promotional measures - Export oriented Units – Deemed Exports - Export- Import Documentation – Kinds of Documents – Principal Export Documents – Auxiliary documents – Documents in Import Trade – Export Documentation and procedures - Demand Estimation – GDP – Producer consumer target – Market segmentation

UNIT - IV INTERNATIONAL MARKETING PLANNING

International Market Selection – Factors influencing – Process – Strategies and approaches – Competition-International Marketing research – Global scene- International marketing research procedure – Techniques – survey – interview techniques – Analysis of field data – Research report-International Marketing Planning and Control – Framework – marketing control – Control sequence

UNIT - V INTERNATIONAL MARKETING MIX

Developing an International Product Line, Foreign Product Diversification, International Branding Decisions, International Packaging, International Warranties and Services. International Pricing Strategy - International Promotion Strategies- Promotion Mix-International Sales Negotiations - Patterns of Global Advertising -Current trends in international Marketing

REFERENCES:

- 01 Varshney “International Marketing”, McGraw Hill, International Edition. 2016
- 02 Global Marketing, Third Edition, by Warren J. Keegan and Mark C. Green, Prentice Hall, 2015.
- 03 Philip .R. Cateora, John.L.Graham. Prasanth Salwan. International Marketing, Tata McGraw Hill,13 th edition, 2014
- 04 Onkvisit, Sak., and John J.Shaw., International Marketing, Prentice Hall of India, New Delhi, 2012.

CONSUMER BEHAVIOUR

L T P C

Course Objectives :

4 0 0 4

- To understand the dimensions of consumer behavior and their decision making process
- To know the Consumer Behaviour Models.
- To Understand the Internal and External Influences on Consumer Behaviour.
- To recognize the social and ethical implications of marketing on consumer behavior.

UNIT - I INTRODUCTION

Concepts – Significance – Dimensions of Consumer Behavior – Application of knowledge of Consumer Behaviour in marketing decisions.

UNIT - II CONSUMER BEHAVIOR MODELS

Industrial and individual consumer behaviour models - Howard- Sheth, Engel – Kollat, Webster and wind Consumer Behaviour Models – Implications of the models on marketing decisions.

UNIT - III INTERNAL INFLUENCES

Psychological Influences on consumer behavior – motivation – perception – personality Learning and Attitude- Self Image and Life styles – Consumer expectation and satisfaction.

UNIT - IV EXTERNAL INFLUENCES

Socio-Cultural, Cross Culture - Family group – Reference group – Communication -Influences on Consumer behavior

UNIT - V PURCHASE DECISION PROCESS

High and low involvement - Pre-purchase and post-purchase behavior – Online purchase decision process – Diffusion of Innovation – Managing Dissonance - Emerging Issues.

REFERENCES:

- 01 Leon G.Schiffman, Leslie Lazar Kanuk and S. Ramesh Kumar, Consumer Behavior, Pearson Education, India, 11th Edition, 2015..
- 02 Jay D. Lindquist and Joseph Sirgy, Shopper, Buyer and Consumer Behavior, Biztranza, 2012.
- 03 David L. Loudon and Albert J Della Bitta, Consumer Behavior, McGraw Hill, New Delhi 2012.
- 04 Sheth Mittal, Consumer Behavior- A Managerial Perspective, Thomson Asia (P) Ltd., 2013

SERVICE MARKETING

L	T	P	C
4	0	0	4

Course Objectives :

- To understand the role of consumer behavior in marketing and to identify qualitative and quantitative methods of measuring consumer behavior.
- To Know the Service Design and Development of Service Marketing.
- To Understand the Service Delivery and Promotion of Service Marketing..
- To know the importance of Service Strategies for Health, Tourism, Financial, Logistics and Educational Institutions.

UNIT - I INTRODUCTION

Definition – Service Economy – Evolution and growth of service sector – Nature and Scope of Services – Unique characteristics of services - Challenges and issues in Services Marketing.

UNIT - II SERVICE MARKETING OPPORTUNITIES

Assessing service market potential - Classification of services – Expanded marketing mix – Service marketing – Environment and trends – Service market segmentation, targeting and positioning.

UNIT - III SERVICE DESIGN AND DEVELOPMENT

Service Life Cycle – New service development – Service Blue Printing – GAP model of service quality – Measuring service quality – SERVQUAL – Service Quality function development.

UNIT - IV SERVICE DELIVERY AND PROMOTION

Positioning of services – Designing service delivery System, Service Channel – Pricing of services, methods – Service marketing triangle - Integrated Service marketing communication

UNIT - V SERVICE STRATEGIES

Service Marketing Strategies for health – Hospitality – Tourism – Financial – Logistics - Educational – Entertainment & public utility Information technique Services

REFERENCES:

- 01 Christopher Lovelock, Jochen Wirtz & Jayantha Chatterjee, Services Marketing - People, Technology, Strategy, Pearson Education, New Delhi, 7th edition, 2015.
- 02 Hoffman, Marketing of Services, Cengage Learning, 1st Edition, 2014.
- 03 Kenneth E Clow, et al, Services Marketing Operation Management and Strategy, Biztantra, 2nd Edition, New Delhi, 2014.
- 04 Christian Gronroos, Services Management and Marketing a CRM Approach, John Wiley, 2015.
- 05 Valarie Zeithaml et al, Services Marketing, 5th International Edition, Tata McGraw Hill, 2014

MASTER OF SOCIAL WORK

JUNE- 2023

CREDIT DISTRIBUTION FOR POST GRADUATE IN SOCIAL WORK [MSW/MA (SW)]

FIRST YEAR

Semester-I

Category	Title of the Subject	Credit	No. of Hours
Core Course - I	Social Work Profession	4	6
Core Course - II	Social Case Work	4	6
Core Course - III	Social Group Work	4	6
Core Course - IV	Field Work – I	4	6
Elective Course – I	Sociological and Psychological Foundations for Social Work (or) Society and Human Behaviour	3	4
Ability Enhancement Compulsory Course Soft Skill - I	Communication for Social Work	2	2
Professional Competence Course	Rural Camp	1	-
Total		22	30

FIRST YEAR

Semester-II

Category	Title of the Subject	Credit	No. of Hours
Core Course - V	Community Organization and Social Action	4	6
Core Course - VI	Social Work Research and Statistics	4	6
Core Course - VII	Social Welfare Administration and Social Legislation	4	6
Core Course - VIII	Field Work – II	4	6
Elective Course - II	Entrepreneurship Development (or) Green Social Work	3	4
Skill Enhancement Course [SEC] - I	Alternative Media / Theatre for Transformation (Outside the Class Hour)	1	-
Ability Enhancement Compulsory Course - Soft Skill - II	Life Skills for Social Work	2	2
Total		22	30

- *Summer Internship : During summer Vacation after Semester II. The Credits shall be awarded in the mark statement of Semester – III*

SOCIOLOGICAL AND PSYCHOLOGICAL FOUNDATIONS FOR SOCIAL WORK

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hrs	Marks		
									CIA	External	Total
	SOCIOLOGICAL AND PSYCHOLOGICAL FOUNDATIONS FOR SOCIAL WORK	Elective Course – I	N	-	-	-	3	4	25	75	100
Year		I									
Semester		I									
Prerequisites		Basic Understanding of Sociology and Psychology									
Learning Objectives											
1	To understand the basics of Psychology										
2	To establish the linkage between psychology, sociology and Human behaviour for effective social work practice										
3	To understand the principles of Human Growth and Development										
4	To understand the dynamics of human and social behaviour										
5	To analyse social problems and evaluate the causes for social problems										
6	To understand about Social Institutions										
Course Outcomes											
On the successful completion of the course, student will be able:											
CO1 : To get an indepth knowledge on the basic concepts of Psychology.											
CO2 : To understand the basic principles of Human growth and Development											
CO3: To develop understanding on the basic concepts of society and social change											
CO4: To analyse the basics of Social Interaction and Social processes											
CO5: To analyse the social Institutions and critically evaluate modern trends in social institutions											
CO6: To understand major social problems in India											

SYLLABUS

UNIT – I

(9 Hours)

Introduction to Psychology: Definition and branches of Psychology – Psychology for Social Work practice - Sensory Process and Perception: Process of Perception - Learning: Classical Conditioning and Operant Conditioning - Memory: Sensory memory, Short-term memory, long term memory, forgetting, improving memory

UNIT – II

(9 Hours)

Human Development: Developmental Psychology - Meaning and principles of growth and development, heredity, environment and ecological influences – family and community - Brief outline of Human Development: Characteristics, developmental tasks, personal and social adjustments, vocational, family / marital adjustments and hazards in each stages such as: Prenatal period, infancy and babyhood - Childhood, Puberty & Adolescence - Adulthood – Middle Age and Old Age

UNIT – III

(9 Hours)

Introduction to Society :Society: Definition - meaning and characteristics - Culture: Definition, characteristics, structure, functions, reasons for cultural - development and cultural change, subculture, contra-culture. - Status & Role: Types and Characteristics - Social Stratification: Definition, Characteristics, Caste, Class & Race. Social Change: Meaning, Characteristics, Change

UNIT – IV

(9 Hours)

Introduction to Groups :Groups - Definition, Characteristics and Classification of Groups - – Primary groups and Secondary Groups - Social Interaction & Social Process: Competition, Co-operation, Conflict, Accommodation & Assimilation. - Socialization: Definition, Characteristics, Types and Agencies of Socializations -Theories of Socialization

UNIT – V

(9 Hours)

Social Institutions: Types of Social institutions: Marriage, Family ,Kinship, Religion, Education ,Economic system and Judiciary Structural aspects - Norms, Values, Folkways & Mores - Family, Marriage, Education, Economy, Polity, Religion

Social Problems - Major Social Problems in India- Causes and factors responsible for Social problems, Untouchability, Slavery, Domestic violence ,Dowry, Social Movements

Case Studies: Some cases of real business world to supplement learning from the course.

Text Books

1. Vidya, Bhushan., Sachdeva, D.(2005). *Introduction to Sociology*. Allahabad: Kitab Mahal.
2. Haralambos. (2014). *Sociology: Themes and perspectives*. Harper Collins; Eight edition
3. Hurlock, Elizabeth B. (1996).*Developmental Psychology-a life span approach*. Tata New Delhi: Mcgraw-Hill Publishing Co.Ltd.
4. Shankar Rao, C. N. (2007). *Sociology: Principles of Sociology with an Introduction to Social Thought*. New Delhi: S Chand & Co. Ltd.
5. MacIver, R.M., Page, C.H. (2000). *Society an Introductory Analysis*. New Delhi: Macmillan Publishers India

Books for References

1. Madan, G.R. (2002) .*Indian Social Problems*, Mumbai : Allied Publishers Pvt. Ltd
2. Morgan, C.T., King, R.A., Weisz, J.R., & Schopler, J (2004) *Introduction to Psychology*. New Delhi: Tata Mc Graw-Hill book Co.
3. Ram Ahuja (2014)*Social Problems in India* ,Third Edition ,Rawat Publications
4. Rawat, H. (2007). *Sociology Basic Concepts*. Jaipur: Rawat Publications
5. Shah, G. 1990. *Social Movements in India: A Review of Literature*. New Delhi: Sage Publications.
6. Zastrow, C. & , K. (2010). *Understanding Human Behavior and the Social Environment*. Chicago: Nelson-Hall.
7. Elgin, F.H.& David, C.(2017),*Social Science- An Introduction to the Study of Society*. (13th ed.). Newyork: Pearson
8. Hutchison, E. (2007). *Dimensions of Human Behavior: Person and Environment*. Thousand Oaks: Sage Publications, Inc

Web Resources

1. www.egyankosh.ac.in/handle/123456789/43
2. <https://www.epw.in>
3. <https://onlinelibrary.wiley.com>
4. <https://www.frontiersin.org>
5. <https://sagepub.com>
6. <https://ir.inflibnet.ac.in>

SOCIETY AND HUMAN BEHAVIOUR

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hrs	Marks		
									CIA	External	Total
	SOCIETY AND HUMAN BEHAVIOUR	Elective Course – I	N	-	-	-	3	4	25	75	100
Year		I									
Semester		I									
Prerequisites		Basic Understanding of Society and Psychology									
Learning Objectives											
1	To understand basic social concepts in the context of changing social phenomenon										
2	To apply the concepts of Sociology in Social Work practice .										
3	To understand the basic concepts in Psychology and Understanding Human Behaviour										
4	To understand the realm of Social issues and its Socio- economic linkages and its link with human behaviour										
5	To analyse various dimensions of Social Problems and Sociological response to it										
6	To acquire social work knowledge and competencies										

Course Outcomes

On the successful completion of the course, student will be able:

CO1 : . To be aware of the concepts related to Sociology and Social Work

CO2 : To understand various patterns of Social Interaction, social processes and its dimensions

CO3: To understand the basic concepts in Psychology and Human Behaviour

CO4: To Understand Social Stratification and the impact of changing Societies

CO5: To understand various social issues and existing agencies of Social control.

CO6: To apply social work competencies to resolve Social problems

SYLLABUS

UNIT – I

(9 Hours)

Introduction to Sociology and Social Work: Introduction to Sociology and Social Work - Definition of Sociology, basic concepts- Society, Community Institution, Association - Meaning and Characteristics. Culture- Definition, characteristics and Cultural lag, Role of Culture in Society, Folk ways & Mores. Relationship between Social Work and Sociology and its Significance, Socialization- Meaning, theories of C.H.Cooley and G.H.Mead, Agencies of Socialization. Status and Role- Types & features

UNIT – II

(9 Hours)

Social Interaction and Social process: Social Interaction and Social process - Associative and Dissociative Process-types- Conflict, Competition, Accommodation, Assimilation - Characteristics, Similarities and Differences

UNIT – III

(9 Hours)

Basic Concepts of Human Behaviour: Introduction to Psychology: Definition and branches of Psychology – Psychology for Social Work practice - Sensory Process and Perception: Process of Perception - Learning: Classical Conditioning and Operant Conditioning - Behaviour- Definition –Biological basis of Behaviour, Structure and Functions of the Nervous system, States of Mind-consciousness, hallucinations. Theories of Human Development, Developmental milestones.

UNIT – IV**(9 Hours)**

Social Institutions & Social Stratification: Social Institutions - Marriage, Family, Kinship, Religion, Education, Economic system and Judiciary- Characteristics and Significance. Social Stratification - Features, Caste, Class & Race- Changing trends, Power structure, Social Mobility, Modernization, Globalization, Sanskritization
Social Change - Nature, characteristics factors and theories related to Social Change

UNIT – V**(9 Hours)**

Social Control: Social Control- Agencies of Social Control, Conformity & Deviance Social Problems - Major Social Problems in India- Causes and factors responsible for Social problems, Untouchability, Slavery, Domestic violence, Dowry, Social Movements.

Case Studies: Some cases of real business world to supplement learning from the course.

Text Books

1. Elgin, F.H. & David, C. (2017), Social Science- An Introduction to the Study of Society. (13th ed.). New York: Pearson
2. Francis, Abraham, M. (2006). Contemporary Sociology. Oxford Oxfordshire: Oxford University Press
3. Madan, G.R. (2002). Indian Social Problems, Mumbai : Allied Publishers Pvt. Ltd
4. Shankar Rao, C. N. (2007). Sociology: Principles of Sociology with an Introduction to Social Thought. New Delhi: S Chand & Co. Ltd.
5. MacIver, R.M., Page, C.H. (2000). Society an Introductory Analysis. New Delhi: Macmillan Publishers India

Books for References

1. Feldman, R.S. (2004). Understanding Psychology (6th Edition), New Delhi, Tata-McGraw Hill.
2. Haralambos. (2014). Sociology: Themes and perspectives. Harper Collins; Eight edition
3. Madan, G.R. (2002). Indian Social Problems, Mumbai : Allied Publishers Pvt. Ltd
4. Morgan, C.T., King, R.A., Weisz, J.R., & Schopler, J (2004) Introduction to Psychology. New Delhi: Tata Mc Graw-Hill book Co.
5. Ram Ahuja (2014) Social Problems in India, Third Edition, Rawat Publications

6. Hutchison, E. (2007). *Dimensions of Human Behavior: Person and Environment*. Thousand Oaks: Sage Publications, Inc
7. Rajendra K Sharma (2007), *Social change and Social Control*, New Delhi, Atlantic Publishers.
8. Shah, G. 1990. *Social Movements in India: A Review of Literature*. New Delhi: Sage Publications.
9. Zastrow, C. & , K. (2010). *Understanding Human Behavior and the Social Environment*. Chicago: Nelson-Hall.

Web Resources

1. www.egyankosh.ac.in/handle/123456789/43
2. <https://www.epw.in>
3. <https://onlinelibrary.wiley.com>
4. <https://www.frontiersin.org>
5. <https://sagepub.com>
6. <https://ir.inflibnet.ac.in>

ENTREPRENEURSHIP DEVELOPMENT

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hrs	Marks		
									CI A	External	Total
	ENTREPRENEURSHIP DEVELOPMENT	Elective Course - II	Y	-	-	-	3	4	25	75	100
Year		I									
Semester		II									
Prerequisites		Interest and Basic Understanding in business									
Learning Objectives											
1	To understand the concept of Entrepreneur and Entrepreneurship development in India.										

2	To acquire skills and techniques required for successful entrepreneur.
3	To develop the ability to critically analyse scope and challenges of entrepreneurship.
4	To develop and understanding about different schemes and program related to entrepreneurship in India.
5	To identify the settings and fields to start up a social enterprise for social change.

Course Outcomes

On the successful completion of the course, student will be able:

CO1: To be aware about the concept, Entrepreneur and Entrepreneurship development in India.

CO2: To bring a change in the society by applying entrepreneurial tool.

CO3: To relate to theories of entrepreneurship development.

CO4 : To apply the competencies and skills of an entrepreneur in the field.

CO5: To demonstrate the use of different schemes and policies related to entrepreneurship for personal and professional development

CO6 : To create an enterprise to solve a social problem

SYLLABUS

UNIT – I

(9 Hours)

Introduction to Entrepreneurship: Meaning and concept of Entrepreneurship, Types of Entrepreneurships –creative entrepreneurship, inclusive entrepreneurship, knowledge entrepreneurship. Evolution of term ‘Entrepreneurship, Factors influencing entrepreneurship’. Entrepreneurship development in India. Scope of entrepreneur development. Barriers to entrepreneurship

UNIT – II

(9 Hours)

Entrepreneur types and characteristics: Entrepreneur- definition, Types of Entrepreneurs – Social entrepreneur, Serial entrepreneur, Life style entrepreneur. Entrepreneurial characteristics. Stages in Entrepreneurial process. The changing role of the entrepreneur;

UNIT – III

(9 Hours)

Theories of Entrepreneurship: Influences on entrepreneurship development; External influences on entrepreneurship development; Women entrepreneurs: Challenges and achievements of women entrepreneurs.

UNIT – IV

(9 Hours)

Social Entrepreneurship: Meaning, definition: Social entrepreneur, social entrepreneurship, social enterprises. Characteristics of Social Entrepreneur- social catalysts, socially aware, opportunity seeking, innovative, resourceful, accountable. Differences between Business and Social entrepreneur, Entrepreneurship and Social Entrepreneurship. Social Entrepreneurship in developing countries and in India.

UNIT – V

(9Hours)

Entrepreneurship Development and Government: Entrepreneurship as a tool for social change, Innovation and inventions, Skills of an entrepreneur Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, programs, schemes and challenges. Government initiatives and inclusive entrepreneurial Growth.

Text Books

1. Khanna, S. S., Entrepreneurial Development, S. Chand, New Delhi.
2. Kuratko, F. Donald, Richard M. Hodgetts, Entrepreneurship: Theory, Process, Practice, Thomson, 7th edition.
3. Robert A. Philips Margret BonefielRitesh Sharma, Social entrepreneurship, the next big business opportunity Global Vision Publishing House, New Delhi, 2011
4. S.S.Khanka, Entrepreneurship in India, perspective and practice, Akansha publishing house, New Delhi, 2009
5. Vasanth Desai, Entrepreneurial development, Himalaya Publishing House, 2008, web resources

Books for References

1. Desai, Vasant, Dynamics of Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi, Latest edition.
2. Holt H. David, Entrepreneurship: New Venture Creation, Prentice- Hall of India, New Delhi, Latest edition. Bornstein, David, how to change the world: social entrepreneurs and the power of new ideas New York, Ny: oxford university press, 2004
3. Patel, V. G., The Seven Business Crises and How to Beat Them, Tata McGraw-Hill, New Delhi, 1995.
4. Roberts, Edward B.(ed 2002.), Innovation: Driving Product, Process, and Market Change, San Francisco: Jossey Bass,
5. Zimmerer W. Thomas, Norman M. Scarborough (2007), Essentials of Entrepreneurship and Small Business Management, PHI,4 ed.

Web Resources

1. <https://www.iare.ac.in/>
2. <https://www.creditmantri.com/>
3. <https://startuptalky.com/>
4. <https://www.yourarticlelibrary.com/>
5. <https://openstax.org/books/entrepreneurship/pages/14-1-types-of-resources>

GREEN SOCIAL WORK

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hrs	Marks		
									CIA	External	Total
	GREEN SOCIAL WORK	Elective Course - II	Y	-	-	-	3	4	25	75	100
Year	I										
Semester	II										
Prerequisites	Basic Understanding of Role of Social Worker in Environment										

Learning Objectives	
1	To understand the concepts of Green Social Work, Ecology, Environment, and Energy resources.
2	To analyse the impact of Globalisation, Industrialization, and Urbanization
3	To enhance the knowledge on various issues on the environment
4	To enable the professional social workers to understand the roles and responsibilities to protect the Environment.
5	To gain knowledge about Environment and Management.

Course Outcomes
On the successful completion of the course, student will be able:
CO1: To be aware of the concepts of Ecology, Environment and Green Social Work
CO2: To understand the causes of environmental issues and its adverse effects.
CO3: To apply the appropriate measures to control and reduce the issues.
CO4: To analyze the Environmental management systems and justice.
CO5: To implement the roles and responsibilities to preserve and protect our environment
CO6: To deal with environmental issues and apply suitable interventions

SYLLABUS

UNIT – I

(9 Hours)

Basic Concepts: Ecology, Environment, Environmental Justice, Climate change, Global warming, Green Transition, Ozone Depletion, biodiversity, deforestation & desertification – Meaning & Concept. Green Social Work - Definition, Importance, Challenges in implementing Green Social Work & GSWN (Green Social Work Network). Natural resources - Concept and types. Ecosystem – Concept, Functions & Types.

UNIT – II

(9 Hours)

Development and its adverse effects on Environment: Technology, Industrialization, SEZ Urbanization and Globalization, Commercialization of Agriculture – changing land use

patterns and the rural society. Construction of Dams and its consequences - Displacement, relocation and rehabilitation, Deforestation and Ecological Imbalance.

UNIT – III

(9 Hours)

Environmental Issues and Control measures: Environmental Pollution: Causes, effects and control of pollutions: – Air, Water, Soil, Noise, Radioactive. Waste Management; Pollution - Air, Water, Soil, Noise and Solid waste Management.

Use of Non-conventional sources of Energy. The Environment Protection Act 1986 - Air Pollution Act 1987 – Water Pollution Act 1974, Wildlife Protection Act, Forest Conservation Act. National Environment policies, National green tribunal, Environment Issues in India.

UNIT – IV

(9 Hours)

Environment Action and Management: Environmental conservation and preservation: Rio+20 & SDGs (6,7,11,12,13 &15). Paris Summit and its implications: Environment Management System: Traditional knowledge and practice: Environmental justice.

UNIT – V

(9 Hours)

Role of Social Worker in Environment Protection and Preservation: Environment Ethics. Environmental Management: Role of Government and NGOs in environment protection and development. Green protocol, Green Social Work Initiatives. Promotion Environment Movements. The Chipko Movement, Narmada Bachao Andolan, Silent Valley Movement.

Text Books

1. Kaushik & Kaushik (2004) Perspective in Environmental Studies, 2ed. New Age International PLtd.
2. Agarwal S.K. 1993. Environmental protection, Himalaya Publishers, New Delhi.
3. Aradhana P.S. 1998. Environmental Management. Rajat Publishers. New Delhi.
4. Susila Appadurai. 2004. Environmental Studies. New Century Book House Publishers. Chennai.
5. Kannan 1991. Fundamentals of Environmental pollution. S. Chand. New Delhi.

Books for References

1. Alka Verma (2015) Green Social Work Environmental Protection, Pentagon Press.
2. Andromeda. 1995. New Science encyclopedia: Ecology and environment. Oxford Publishers. London
3. Aravind Kumar. 2008. Environmental Resource Management. Daya Publishers. New Delhi:
4. Aray and Abbasi 1995. Urbanisation and its Environmental Impacts. New Delhi: Discovery
5. Asthana. D.K. 2001. Environmental Problems and solutions. S. Chand publishers. New Delhi.
6. Barrow CJ (2006) Environmental Management for Sustainable Development, Routledge Taylor & Francis Group
7. Dash Sharma P. 1998. Environment Health and development. Anmol Publishers. New Delhi.
8. Dominelli L(2012) Green Social Work: From Environmental Crises to Environmental Justice, Polity Press
9. GuhaRamchandra, 1991 The Unquietwoods, Ecological Change and Peasant Resistance in the Himalayas, New Delhi: Oxford University Press
10. Luoma Samuel N. 1984. Introduction to environmental Issues. Macmillan Publishers. Calcutta.
11. Maharajan V.S. 1986. Environment protection: challenges and Issues. Deep and Deep Publishers. New Delhi

12. Mohan I. 2002. Environmental Problems in 21st Century. Anmol Publishers. New Delhi
13. Mohanty. S.K. 1997. Environment and pollution Law Manual. Universal Publishers. New Delhi.
14. Ravichand. M. 2007. Environmental Management. Concept Publishers. New Delhi.

Web Resources

1. <https://www.india.gov.in/official-website-ministry-environment-and-forests-0>
2. <https://moef.gov.in/en/rules-and-regulations/environment-protection/>
3. <http://www.indiaenvironmentportal.org.in/>
4. <http://www.envis.nic.in/>
5. <https://cpcb.nic.in/>
6. <https://www.aasw.asn.au/victoria/green-social-work-network>

Manonmaniam Sundaranar University
M. Phil Social Work Programme
 (for affiliated colleges with effect from 2018 – 2019 Onwards)

S.No	Semester	Course Title	Credits	Hours / Week
1	I	Core- I : Research and Teaching Methodology	4	4
2	I	Core- II : Contemporary Social Work	4	4
3	I	Project Oriented Electives: 1. Human Resources Management 2. Family & Child Welfare 3. Community Development 4. Medical and psychiatric Social Work	4	4
4	II	Project & Viva – Voce	12	-
		Total	24	-

HUMAN RESOURCES MANAGEMENT

Project Oriented Elective No: 1

L T P C
4 0 0 4

Objectives:

- To develop the knowledge of students about fields of Human Resource Management, its importance, practice and application.
- To develop an insight in students about various theories & challenges of Human Resource Management

Unit I

HRM – concept, meaning and evolution of HRM and HRD. HR - challenges and opportunities, HR – policies, procedures and programmes - HR policies, procedures and programmes - HR planning, recruitment, selection, placement, psychometric tests, employee attrition and retention, career planning and development and strategic HRM.

(12 L)

Unit II

Compensation Management – wage and salary Administration, current trends in compensation Management. Training and Development – policy, training need analysis, designing, conduction and evaluation of training. Competency mapping, knowledge Management.

(12 L)

Unit III

Performance Appraisal and potential appraisal, performance, counseling, performance management, grievance handling, health and safety management – TQM (Total Quality Management), Quality at work life (QWL). Employee separation, HR Audit and HR Outsourcing.

(12 L)

Unit IV

Management of change: Process of managing organizational change, managing resistance to change, strategies and guidelines for imparting change approaches to planned change - process of organizational development, designing intervention and evaluation intervention. Team building – conflict management. **(12 L)**

Unit V

Corporate Social Responsibility (CSR) – concept - need, importance, CSR in Indian context and in Global scenario, corporate community participation, role and skills of social policies and activities, CSR standards and norms, case of successful CSR initiatives. **(12 L)**

(Total 60 L)

References:

1. Bhatia S.K, "Human Resource Management" – A competitive advantage, Deep and Deep publications Pvt. Ltd . New Delhi 2006.(658. 3B).
2. Dipak Kumar Bhattacharya, Human Resources Management. Excel Books, New Delhi 2002 (658.3D)
3. Jyothi P. and Venkatesh D.N, Human Resource Management. Oxford University Press New Delhi 2006 (658.3j)

FAMILY AND CHILD WELFARE

Project Oriented Elective No: 2

4 0 0 4

Objectives:

- To help the students understand the Theoretical and conceptual framework of family and welfare issues.
- To understand and promote Child, women and youth welfare.

Unit I

Theoretical and conceptual framework to study family: origin and evolution of family and marriage. Ideology of family rights and responsibilities, normative family and marriage function and structure, ethnicity and socio-economic background, Social changes and changes in family and marriage function and structure, implications for the family and its members. Alternative family and marriage patterns and structure: dual earner/carrier family single parent families, female headed household childless family, methods for family assessment and its implications, modes of awareness building. **(12L)**

Unit II

Family Welfare: concept, family planning and family welfare planning, methods of family planning, critical review of International, National and state policies and programmes for family planning, life education population, education and sex education: concept, scope, need, techniques. History and definition of family violence, studying family violence. Theories of family violence. **(12L)**

Unit III

Child welfare: Concept, constitutional safeguard, International, National and state level policies, child rights - UN charter legislations related to child, Factors influencing child development, girl child socio-economic practices and their impact on girl child. Child in special circumstances - destitute child, delinquents child: child welfare board. Child abuse, and neglect, societies' role in abuse and neglect, child exposed to domestic violence. Critical review of child welfare programmes of UNICEF, WHO, ILO, Government of India and state government. **(12L)**

Unit IV

Challenges and Intervention in Youth welfare: Concept of youth, youth profile, socialization of youth, youth problems - behaviour, functional and emotional problems. Role of youth in freedom movement, social change, politics, youth movement and ideologist, youth unrest and youth development. Youth welfare: concept definition, philosophy and evolution of youth welfare programmes in India. Policies and

Programmes for youth, and training for youth leadership, problems of rural, urban and tribal youth and application of social work methods in working with youth groups. **(12L)**

Unit – V

Women welfare & Gender Issues: Status of women, concept of reproductive health and rights, gender and women development, problems of rural, urban and tribal women, critical analysis of third gender and their rights, women trafficking, women in commercial sex, women in non formal/informal sector, women in slums, women and education, critical review of policies, programmes and legislation to women. **(12L)**

(Total 60)

L) Reference:

1. Besharov, D.J. (1990), Recognizing child abuse: A guide for the concerned, The free press, New York.
2. Chalk , R. & King P.A. (eds) (1998), Violence in families: Assessing prevention and treatment programs,
3. Crosson-Tower, C. (2002), Understanding child abuse and neglect (5th Ed). Boston: Allyn & Bacon.
4. Crowell, N.A & Burgess A.W (eds) 1996), Understanding violence against women
5. D.C. National Academy press Washington
6. Dutton, D.(1995), The domestic assault of women; Psychological and criminal justice perspective, CA: UBC press, British.
7. Jayanthi, I and Thomas William A, (2017) Disaster and Tsunami: Psychosocial Impact, Kapaz Publication, New Delhi.
8. Migonon, S.I, Larson C.J., & Holmes, W.M. (2002) Family abuse: consequences, theories and responses, MA: Allyn & Bacon , Boston.

Community Development

Project Oriented Elective No: 3

4 0 0 4

Objectives:

- To help the students understand various communities living in India.
- To understand the various programmes related to community development.

Unit - I Rural development-concept problem and issues

Rural community – rural urban differences and continuum – types of Indian village community concept and need of rural community development - approaches of rural development. Spatial planning approach - multipurpose approach, integrated development approach, area development approach - multilevel district planning, target sector approach – illiteracy – poverty - unemployment, underemployment, seasonal employment, untouchability, communal conflicts – political issues – impact of globalization. (14L)

UNIT – II Rural community Development Administration

Organizational set up and administration from national to block level – central rural development ministry and community development agencies and district level rural development agencies and district planning authorities – functions of block development officer and extension officer – role of voluntary agencies in rural community development. (12L)

UNIT - III Concept and problems of urban community

Definition, classification, characteristics and theories of urbanization, SLUM: definition, theories, causes and characteristics, housing Deviant behaviour, corruption, prostitution, beggary, sanitation, health congestion , pollution. (10L)

UNIT IV

History of urban local self-government in India, form of urban local self-government, organizational structure and functions. Problems of municipal administration in India. Process of organizing the communities. New trends in popular participation in Development. Relevance of Social work practice (10L)

UNIT - V Rural and urban community development programmes

Rural Development Programme: A very brief idea on IRDP, ITDP, TRYSEM, DWACRA - In-depth study on Centre and State current programmes.**Urban Development Programmes:** Urban development policies; Town planning and Related Legislations; Town planning Acts; Land Acquisition Act, programmers: A very Brief idea on IUDP, UBS; In-depth study on recent programmes: Swarna Jayanthi Shahari Rozgar Yozna: Development of women and children in urban areas; Urban self – Employment Scheme; National Slum Development Programmes; Urban Wage employment Programmes. (14L)

(Total 60 L)

REFERENCES:

1. Cerdic Pagh (1990) Housing and urbanization: A study of India, New Delhi. Sage.
2. Christopher and Thomas William, (2011) Community Organisation and Social Action, 2ed. Himalaya Publications, Mumbai.
3. Dahama O.P (1982). Extension and Rural welfare, Agra, Ram Prasad and sons.
4. Desai A.R. Rural sociology in India , Bombay Popular Prakashan.
5. Dube S.C (1958) India's changing villages, London Rutledge and Kegan Paul.
6. Dube M.K (2000) Rural and urban development New Delhi, common health
7. Gopala Krishna & Ansari V. (1985), Technological change for Rural Development in India.
8. Dana Chekki (1979). Community development: theory and method of planned change, New Delhi Vikas.
9. Mahajan V.S. (Ed).(1993). Employment through rural development onwards sustainability, New Delhi Deep and Deep.
10. Madras school of social proceedings of the national seminar on people's participation in community development, Madras.
11. Mihal S.P and Rafio Khan M. History of Rural Development in Modern India New Delhi Gandharan Institute of studies.
12. Mishra G.P. Dynamics of Rural Development in village India. New Delhi. Ashiash.
13. Rajeswar Dayar (1962) Community development programmes in India. Allahabad, Kitals Mahal.
14. Ram K. Verma (1996) Development Infrastructure for Rural Economy, Jaipur Print Hell.
15. Thakur B.N (1988) Sociology of rural development, New Delhi Classical.
16. Thoha, M. and Om Prakash (1989) integrated rural development (Vo I and Vo I) Bangalore sterling.
17. Thomas William A. and Christopher A.J. (2011) Rural Development: Concept and Recent Approaches, Rawat Publications, Jaipur.
18. Vasudeva Rao, D (1985) Fact and rural development, New Delhi Ashiash.
19. Vijay C.M (1984) Rural Community Administration in India, Jaipur prateek

Medical and Psychiatric Social work

Project Oriented Elective No: 4

4 0 0 4

Objectives:

- To develop and understand issues relating to Mental Health, Illness, Psychiatric and Medical Social Work and to promote interventional strategies

Unit I

Mental health and illness: Concept of positive mental Health, Psychological well being, mental health and illness, attitude towards mental illness, epidemiological studies and socio demographic correlates of mental illness in India. **View points of illness:** biological, psycho-social and socio-cultural: causal factors in abnormal behavior, perspective on causation: biological and psycho-social causal factor. Anxiety disorders, disassociative (conversion) disorders, obsessive compulsive disorders, adjustment disorders and behavioral syndromes associated with psycho physiological disorders. Psychopathology of personality and behavior disorders, specific personality disorders, behavior disorders due to psychoactive substance use and alcoholism, sexual dysfunctions and disorders, psycho active substance use disorders. **(16L) Unit 2**

Psychiatric social work: History, objectives, scope, nature and principles of psychiatric social work, role of psychiatric social worker in hospitals, day care centre, foster homes, community projects and educational institutions, half way home. Psychological based therapies: psycho dynamic therapy, behaviour therapy, cognitive behaviour thereby, humanistic experiential therapies and therapy for inter personal relationship. Applications of tools/scales to measure the psychiatric disorders and use of statistical package (practical exposure study). **(14L)**

Unit 3

Medical Social work: Concept, historical development, principles, need and scope. Dimensions of health; positive health and well being; determinants of health, right to health; indicators of health, parameters of community health, philosophy of health services. **(10L)**

Unit 4

Pathology of Disease: Causation, modes of transmission, disease control, concept of prevention and level of prevention, mode of intervention and changing patterns of disease. **(10L)**

Unit 5

Hospital planning and Administration: Management process and principles, hospital organization structure, hospital planning and challenges of the administration of hospital services, administration of outpatient and inpatient services, emergency services in hospitals, planning and management of ophthalmic services, radiotherapy and oncology centre, management of neonatal intensive care, administration of rural hospitals, role of hospitals in primary health. **(10L)**

(Total 60 L)

References:

1. Robert C. Carson James N. Butcher & James C. Coleman: Abnormal psychology and modern life (8th edition), Marfatia j.c: Psychiatric of Children Popular Prakhasan , Bombay, 1971.
2. Roberts N. Mental health and mental illness, Rutledge & Kegan Paul, London 1967.
3. Eden D.J. Mental handicap – an introduction George Allen and unnin , London, 1976.
4. Gaind R.N. Hudson B.L.: Current themes in psychiatry Mc millan, 1979
5. Bartlell,Harriet M.: Social work practice in Health field, New York National Association of social workers., 1961
6. Banergee G.R.: Social service Departments in Hospitals – Is organizations and functions , TISS , Bombay, 1950
7. J.E Park, social and preventive Medicine
8. John Howells G. Modern perspective in international child
9. Psychiatry, Williams & wilkins , Vol. 2 & 3 1980
10. Verma, Ratna , Psychiatric social work in India, sage Pub., New Delhi, 1991
11. Skinner, sue Walrond: Developments in family therapy, Rutledge & Kegan Paul, London, 1981
