

A.V.V.M. Sri Pushpam College (Autonomous), Poondi – 613 503

PG & Research Department of Chemistry

B.Sc. Programme in Chemistry

OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

SCHEME OF PROGRAMME AND SYLLABUS

(For the candidates admitted from 2023-2024 onwards)

Vision and Mission of the college

Vision

To provide quality academic programmes and value oriented higher education to the rural community, equip them to encounter current regional, national and global demands upholding moral standards and intellectual competency.

Mission

- To provide conducive environment for quality teaching-learning process and innovative research.
- To bestow substantial educational experience that is intellectually, socially, and personally transformative.
- To strive to bring out the latent potentiality and core competency of the learners
- To foster the culture of research-based learning, independent academic inquiry by encouraging the students to involve in research activities ranging from hands on training, student projects, publications etc.,
- To nurture essential skills, competent minds and compassionate hearts.
- To impart a practical, demanding and overall development of the personality generated by love, consideration and care for the society.
- To serve the society by extending needful outreach programmes to the rural populace.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Make the learners realise the transformative power of education.
- Acquire profound disciplinary, applied, integrative knowledge and intellectual competency and domain specific and generic skills.
- Pursue lifelong learning and generate innovative solutions for the problems at individual and social level.
- Create a collaborative and inclusive environment, and serve the betterment of the society with moral integrity.
- Motivate to become a committed professional with necessary ethics as a leader as well as a team player.

PROGRAMME OUTCOMES for B.Sc. Chemistry Programme

On the completion of the programme, the learners will be able to,

PO1: Well equip with analytical and logical skills which will accomplish with a sound knowledge of the core and the allied papers.

PO2: Communicate effectively from professional life to personal life and interpret information more accurately and quickly.

PO3: Attain knowledge to figure out scientific data critically and systematically and ability to draw objective conclusions thereof.

PO4: Develop scientific temper, which beneficial for the society, as the scientific developments can grow a nation or a society at a rapid pace through research.

PO5: Enrich skill to understand social, ethical, global and environmental responsibility for the benefit of the society.

PO6: Function effectively as a member or a leader of a team engaged in activities relevant to the program's discipline.

PO7: Enroll in self-sufficient and lifelong learning in the extensive context of socio technological changes.

PROGRAMME SPECIFIC OUTCOMES for B.Sc Chemistry Programme

On the completion of the programme, the learners would have,

PSO1: Proficient in the basic knowledge and lab skills in all field of chemistry

PSO2: Acquired the ability to communicate the basic concepts of chemistry

PSO3: Equipped them to analyze the elements and compounds qualitatively and quantitatively by laboratory techniques

PSO4: Developed the scientific temper through research, industrial visit and chemistry related courses.

PSO5: Acquired skill to understand chemistry related social, ethical, global and environmental responsibility for the benefit of the society

PSO6: Work effectively as a member or a leader in organizations or industries related to chemistry fields.

PSO7: Confidently appear for competitive examinations such as, UPSC, TNPSC, CSIR-JRF/NET, SLET and BARC and also to become entrepreneur.

Curriculum structure for UG Programmes (OBE-CBCS) – 2023

	Nature of Course	Total No. of Courses	Total marks	Total credits	Total credits for the Programme
Part – I	Language (Tamil / Hindi)	04	400	12	123 (CGPA)
Part – II	English	04	400	12	
Part – III	Core Courses	14	1400	65	
	Core Industry Module (CIM)	01	100	04	
	Elective Courses(Generic) - Allied	06	600	18	
	Elective Courses (Discipline Centric)	04	400	12	
Part – IV	Skill Enhancement Course - Non Major Elective (NME)	01	100	02	17 (Non CGPA)
	Skill Enhancement Course – Discipline Specific (SEC)	02	200	04	
	Professional Competency Skill Enhancement Course (PCSE)	01	100	02	
	Gender Studies (GS)	01	100	02	
	Environmental Studies (ES)	01	100	02	
	Value Education (VE)	01	100	02	
	Internship / Industrial Activity	--	--	02	
Part – V	Extension Activity (EA)	--	--	01	
	Total	40	4000	140	140
	Value Added Course (VAC)	01	100	--	--
	Extra Credit Course – MOOC / Field visit / Hands on Training	--	--	Max: 4	--

***Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree**

S. No.	Semester	Part	Category	Course Code	Title of the Course	Maximum Marks			Minimum Marks			Hours/Week	Credits							
						CIA	EE	Total	CIA	EE	Total									
19.	IV	I	Language	23U4CHT4/H4	Tamil – IV / Hindi – IV	25	75	100	10	30	40	6	3							
20.		II	Language	23U4CHE4	English – IV	25	75	100	10	30	40	6	3							
21.		III	Core - CIM	23U4CHCIM	Industry Module: General Chemistry–IV	25	75	100	10	30	40	4	4							
22.			Core	23U4CHCP4	Physical Chemistry Practical- I	25	75	100	10	30	40	5	4							
23.			Allied	23U4CHPHAPL	Physics (Non-Semester)	25	75	100	10	30	40	3	3							
24.			Allied	23U4CHPHA2	Physics	25	75	100	10	30	40	4	3							
25.		IV	SEC	23U4CHSEC1	Digital Literacy in chemistry	25	75	100	10	30	40	2	2							
26.			GS	23U4CHGS	Gender Studies	-	100	100	-	-	40	SS	2							
			Extra Credit	Field visit / Hands on Training		-	-	-	-	-	-	-	-							
27.	V	III	Core	23U5CHC4	Organic Chemistry -I	25	75	100	10	30	40	5	5							
28.			Core	23U5CHC5	Inorganic Chemistry - I	25	75	100	10	30	40	5	5							
29.			Core	23U5CHC6	Physical Chemistry -I	25	75	100	10	30	40	5	5							
30.			Elective	23U5CHEL1A/ 23U5CHEL1B	Biochemistry / Analytical chemistry	25	75	100	10	30	40	4	3							
31.			Elective	23U5CHEL2A/ 23U5CHEL2B	Pharmaceutical Chemistry / Food Chemistry	25	75	100	10	30	40	4	3							
32.			NME	23U5CHNME	Cosmetics, perfumes and Pesticides	25	75	100	10	30	40	2	2							
33.			Core	23U5CHC7PR	Project with Viva Voce	25	75	100	10	30	40	5	4							
		IV	Internship / Industrial Training (Carried out in II Year summer vacation – 30 hours)										-	2						
34.	VI	III	Core	23U6CHC8	Organic Chemistry -II	25	75	100	10	30	40	6	5							
35.			Core	23U6CHC9	Physical Chemistry -II	25	75	100	10	30	40	5	5							
36.			Core	23U6CHCP5	Gravimetric & Organic preparation practical	25	75	100	10	30	40	5	5							
37.			Elective	23U6CHEL3A/ 23U6CHEL3B	Fundamentals of Spectroscopy / Nanoscience	25	75	100	10	30	40	5	3							
38.			Elective	23U6CHEL4A/ 23U6CHEL4B	Inorganic Chemistry - II / Industrial chemistry	25	75	100	10	30	40	5	3							
39.		IV	SEC	23U4CHSEC2	Textile chemistry	25	75	100	10	30	40	2	2							
40.			PCSE	23U6CHPCSE	Comprehensive Knowledge	-	100	100	-	40	40	2	2							
			Extension			Extension Activities (Outside College hours)								-	1					
						Total						4000								
		Value Add Course			Food science and quality control								-	100	100	-	40	40	SS	-

Internship/ Industrial Activity:

Students must complete in-plant training in any industry or organization where a programme-related procedure is being used, and this training must be done during the summer vacation at the end of II Year. A minimum of 30 hours should be spent on training. Students must submit a report on their training together with a certificate from the relevant industry or organization authority.

MOOC:

Massive Open Online Course (MOOC) is offered in the II and III Semester as an Extra Credit Course. Students can avail any one or more of the courses available in MOOC to equip their skill and knowledge themselves. To receive the extra credit, students must provide their MOOC course completion certificate at the end of the second year.

Field visit / Hands on Training:

In order to achieve experiential learning, these programmes with a minimum of 15 hours of contact time are offered as Extra Credit Courses in the III & IV Semester.

Evaluation of visit report will be held at the end of IV Semester.

Components of Evaluation:

Internal Marks : 25

External Marks : 75

Total : 100

Skill Enhancement course (SEC) offered by Chemistry Department

1. Digital Literacy in chemistry
2. Textile chemistry

Non – Major Elective (NME) Course offered by Chemistry Department

Cosmetics, perfumes and Pesticides

Value Added Course offered by Chemistry Department

Food science and quality control

**A.VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE (AUTONOMOUS),POONDI,
THANJAVUR DIST.
(NAAC Re-Accredited with A grade in 4th cycle)
Question Pattern for UG and PG Programmes
(For the students admitted from 2023 – 2024 onwards)**

Bloom's Taxonomy based Assessment pattern

Bloom's category	Section	Choice	Marks	Total
K1 to K6	A	Compulsory	10 x 2 = 20	75
	B	Either / Or	5 x 5 = 25	
	C	3 out of 5	3 x 10 = 30	

OBE QUESTION PATTERN

Total Marks: 75

SECTION – A (10 x 2 = 20)			
Answer All the questions (Two Questions from each units)			
CO	K Level	Q. No.	Questions
		1.	
		2.	
		3.	
		4.	
		5.	
		6.	
		7.	
		8.	
		9.	
		10.	
SECTION – B (5 x 5 = 25)			
Answer All the questions (One Question from each unit)			
		11(a).	
(OR)			
		11(b).	
		12(a).	
(OR)			
		12(b).	
		13(a).	
(OR)			
		13(b).	
		14(a).	
(OR)			
		14(b).	
		15(a).	
(OR)			
		15(b).	
SECTION – C (3 x 10 = 30)			
Answer ANY THREE questions (One Question from each unit)			
		16.	
		17.	
		18.	
		19.	
		20.	

Bloom's Taxonomy Action Verbs

K1 Remember	K2 Understand	K3 Apply	K4 Analyze	K5 Evaluate	K6 Create
<ul style="list-style-type: none"> • Choose • Copy • Define • Describe • Discover • Duplicate • Enumerate • Examine • Find • How • Identify • Label • List • Locate • Match • Memorize • Name • Omit • Recall • Recognize • Relate • Select • Show • Spell • State • Tabulate • Tell • What • When • Where • Which • Who • Why 	<ul style="list-style-type: none"> • Associate • Classify • Compare • Contrast • Convert • Demonstrate • Describe • Differentiate • Discuss • Distinguish • Estimate • Explain • Express • Extend • Identify • Illustrate • Indicate • Infer • Interpret • Outline • Paraphrase • Predict • Relate • Rephrase • Show • Summarize • Translate 	<ul style="list-style-type: none"> • Apply • Build • Calculate • Change • Choose • Complete • Construct • Demonstrate • Develop • Discover • Dramatize • Experiment • Identify • Interview • Interpret • Illustrate • Make use of • Manipulate • Model • Modify • Organize • Paint • Plan • Prepare • Produce • Relate • Select • Show • Sketch • Solve • Use • Utilize 	<ul style="list-style-type: none"> • Advertise • Appraise • Analyze • Assume • Break down • Categorize • Classify • Compare • Conclusion • Connect • Contrast • Differentiate • Discover • Dissect • Distinguish • Discriminate • Divide • Examine • Explain • Function • Inference • Inspect • List • Motive • Order • Point out • Prioritize • Relationships • Select • Separate • Simplify • Subdivide • Survey • Takepartin • Test for • Theme 	<ul style="list-style-type: none"> • Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Convince • Criteria • Criticize • Decide • Deduct • Defend • Determine • Discriminate • Estimate • Evaluate • Explain • Find errors • Grade • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Order • Predict • Prioritize • Prove • Rank • Rate • Recommend • Reframe • Select • Summarize • Support • Value 	<ul style="list-style-type: none"> • Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Generalize • Hypothesize • Imagine • Improve • Integrate • Invent • Make up • Maximize • Minimize • Modify • Originate • Organize • Plan • Predict • Prepare • Produce • Propose • Rearrange • Rewrite • Role-play • Solution • Solve • Substitute • Write

B.Sc. Chemistry

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
I	23U1CHT1	வ்யாதுத் தமிழ் – 1	6	3

Nature of the Course

1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது	✓	7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்கல்	
2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது		8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது	✓
3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது	✓	9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது	
4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல்		10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது	
5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல்		11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது	
6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல்	✓		

Course Objectives

- முதலாமாண்டுப் பட்ட வகுப்பு மாணவர்களுக்குத் தமிழ் மொழி இலக்கியங்களை அறிமுகம் செய்தல்
- தற்கால இலக்கியப் போக்குகளையும் இலக்கணங்களையும் மாணவர் அறியுமாறு செய்தல்.
- மாணவர்களுக்குத் தமிழ் படைப்பாற்றலைத் தூண்டுதல்.
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.

Unit	Details	Hours
Unit-I	<p>மரபுக் கவிதை</p> <ol style="list-style-type: none"> பெ. சுந்தரனார் - தமிழ்த் தெய்வ வணக்கம் பாரதிதாசன் - சிறுத்தையே வெளியில் வா கவிமணி - புத்தரும் சிறுவனும் முடியரசன் - மொழி உணர்ச்சி கண்ணதாசன் - ஆட்டனத்தி ஆதிமந்தி — ஆதிமந்தி புலம்பல் சுரதா - துறைமுகம் தொகுப்பிலிருந்து ஏதேனும் ஒரு கவிதை தமிழ் ஒளி - கடல் 	18 Hrs

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Unit-II	<p>புதுக்கவிதை</p> <ol style="list-style-type: none"> 1. அப்துல் ரகுமான் - வீட்டுக்கொரு மரம் வளர்ப்போம் 2. ஈரோடு தமிழன்பன் - சென்றியூ கவிதைகள் (ஏதேனும் ஐந்து கவிதைகள்) 3. வைரமுத்து - பிற்சேர்க்கை 4. மு.மேத்தா- வாழைமரம் 5. அறிவுமதி -வள்ளுவம் பத்து 6. நா முத்துக்குமார் - ஆனந்த யாழை மீட்டுகிறாய் 7. சுகிர்தராணி - சபிக்கப்பட்ட முத்தம் 8. இளம்பிறை -நீ எழுத மறுக்கும் எனது அழகு 	18 Hrs
Unit-III	<p>சிறுகதைகள்</p> <ol style="list-style-type: none"> 1. வாய்ச் சொற்கள் - ஜெயகாந்தன் (மாலை மயக்கம் தொகுப்பு) 2. கடிதம் - புதுமைப்பித்தன் 3. முள்முடி - தி ஜானகிராமன் 4. சிதறல்கள் - விழி.பா.இதயவேந்தன் 5. காகித உறவு - சு.சமுத்திரம் 6. வீட்டின் மூலையில் சமையல் அறை - அம்பை 7. (மொழிபெயர்ப்புக் கதை) ஆண்டன் செக்காவ் - நாயக்காரர் சீமாட்டி, சந்தியா 	18 Hrs
Unit-IV	<ol style="list-style-type: none"> 1. பாடம் சார்ந்த இலக்கிய வரலாறு 2. இராகபாவம் — கேட்டிவி 	18 Hrs
Unit-V	<p>மொழித்திறன் போட்டி தேர்வு</p> <ol style="list-style-type: none"> 1. பொருள் பொதிந்த சொற்றொடர் அமைத்தல் 2. ஓர் எழுத்து ஒரு மொழி 3. வேற்றுமை உருபுகள் 4. திணை, பால், எண், இடம் 5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு. <p>(குறிப்பு: அலகு 4, 5 ஆகியன போட்டித் தேர்வு நோக்கில் நடத்தப்பட வேண்டும்).</p>	18 Hrs
CO Number	CO Statement	Cognitive Level
CO1	பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல்.	K2
CO2	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்.	K3
CO3	இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுவர்.	K4
CO4	மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல்.	K3
CO5	தமிழ்மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்ளுதல்.	K5

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ்

பார்வை நூல்கள்

1. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்
2. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல்
3. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resource

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. www.tamilvu.org/library
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <<http://www.chennailibrary.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- [tamale books downloads. blogspot.com](http://tamalebooksdownloads.blogspot.com)
7. Tamil Books on line- [books.tamil cube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

பொதுத்தமிழ் —1												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	2	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	3	3	2	2	2	3	3

B.Sc. Chemistry

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23U1CHE1	PART - II GENERAL ENGLISH	6	3

Learning Objectives		
LO1	To enable earners to acquire self awareness and positive thinking required in Various life situations.	
LO2	To help the macquire the attribute of empathy	
LO3	To assist them in acquiring creative and critical thinking abilities	
LO4	To enable them to learn the basic grammar	
LO5	To assist the min developing LSRW skills	
Unit No.	Unit Title &Text	No.of Periods for the Unit
I	SELF-AWARENESS(WHO) & POSITIVE THINKING (UNICEF) Life Story Chapter 1 from Malala Yousafzai, I am Malala An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3) M.K.Gandhi Poem Where the Mind is Without Fear–Gitanjali 35– Rabindranath Tagore Love Cycle– Chinua Achebe	20
II	EMPATHY Poem Nine Gold Medals– David Roth Alice Fellor poverty–William Words worth Short Story The School for Sympathy– E.V. Lucas Barn Burning – William Faulkner	20
III	CRITICAL & CREATIVE THINKING Poem The Things That Haven't Been Done Before– Edgar Guest Stopping by the Woods on a Snowy Evening– Robert Frost Readers Theatre The Magic Brocade – A Tale of China Stories on Stage–Aaron Shepard (Three Sideway Stories from Wayside School” by Louis Sachar)	20
IV	Reflective Thinking The Running Rivulets of man The Lady in the Silver Coat Mr.Applebaum at Play The Feigning Brawl of an Imposter Thy Life is my Lesson	15
V	Communication Skill Part of Speech Articles Noun Pronoun Verb Adverb Adjective Preposition	15

Course Outcomes		
Course Outcomes	On completion of this course, students will:	
CO1	Acquire self awareness and positive thinking required in various life situations	PO1,PO7
CO2	Acquire the attribute of empathy.	PO1,PO2,PO10
CO3	Acquire creative and critical thinking abilities.	PO4,PO6,PO9
CO4	Learn basic grammar	PO4,PO5,PO6
CO5	Development and integrate the use of four language skills i.e., listening, speaking, reading and writing.	PO3,PO8

Textbooks (Latest Editions)	
1.	Malala Yousafzai. Iam Malala, Little, Brown and Company, 2013.
2.	M.K.Gandhi. An Autobiography or The Story of My Experiments with Truth (Chapter – I), Rupa Publications, 2011.
3.	Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings): A Collection of Prose Translations Made by the Author from the Original Bengali. MacMillan, 1913.
4.	N.Krishnasamy. Modern English: A Book of Grammar, Usage and Composition Macmillan, 1975.
5.	Aaron Shepard. Stories on Stage, Shepard Publications, 2017.
6.	J.C.Nesfield. English Grammar Composition and Usage, Macmillan, 2019.
7.	Sri.KTV. Melodious Harmony, New Century Book House. 2022

Web Resources	
1	Malala Yousafzai. Iam Malala (Chapter 1) https://archive.org/details/i-am-malala
2	M.K.Gandhi. An Auto biography or The Story of My Experiments with Truth (Chapter-1)- Rupa Publication, 2011 https://www.indiastudychannel.com/resources/146521-Book-Review-An-Autobiography-or-The-story-of-my-experiments-with-Truth.aspx
3	Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings) https://www.poetryfoundation.org/poems/45668/gitanjali-35
4	Aaron Shepard. Stories on Stage, Shepard Publications, 2017 https://amzn.eu/d/9rVzINv
5	JCNesfield. Manual of English Grammar and Composition. https://archive.org/details/in.ernet.dli.2015.44179

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3
Weight age	15	15	15	15
Weighted percentage of Course Contribution to POS	3.0	3.0	3.0	3.0

3- Strong, 2 -Medium, 1-Low

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23U1CHC1	GENERAL CHEMISTRY-I	7	7
Objectives of the course	The course aims at giving an overall view of the <ul style="list-style-type: none"> • various atomic models and atomic structure • wave particle duality of matter • periodic table, periodicity in properties and its application in explaining the chemical behaviour • nature of chemical bonding, and • fundamental concepts of organic chemistry 			
Course Outline	<p>UNIT I Atomic structure and Periodic trends</p> <p>History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli' exclusion principle and Aufbau principle; Numerical problems involving the core concepts.</p> <p>Unit II Introduction to Quantum mechanics</p> <p>Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2.</p> <p>Modern Periodic Table</p> <p>Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity - electronegativity scales, applications of electronegativity. Problems involving the core concepts.</p>			
	<p>UNIT-III: Structure and bonding - I</p> <p>Ionic bond</p> <p>Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.</p> <p>Covalent bond</p> <p>Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency -hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7 Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4; percentage ionic character- numerical problems based on calculation of percentage ionic character.</p>			

	<p>UNIT-IV: Structure and bonding - II</p> <p>VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO₂, NO₂, CO₃²⁻, NO₃⁻; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H₂, C₂, O₂, O₂⁺, O₂⁻, O₂²⁻, N₂, NO, HF, CO₂ magnetic characteristics, comparison of VB and MO theories.</p> <p>Coordinate bond: Definition, Formation of BF₃, NH₃, NH₄⁺, H₃O⁺ properties</p> <p>Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boilingpoints.</p> <p>UNIT-V: Basic concepts in Organic Chemistry and Electronic effects</p> <p>Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes. Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance. Hyperconjugation - stability of alkenes, bond length, orienting effect of methylgroup, dipole moment of aldehydes and nitromethane. Types of organic reactions- addition, substitution, elimination and rearrangements</p>
Recommended Text	<ol style="list-style-type: none"> 1. Madan, R. D. and Sathya Prakash, <i>Modern Inorganic Chemistry</i>, 2nded.; S.Chand and Company: New Delhi, 2003. 2. Rao, C.N. R. <i>University General Chemistry</i>, Macmillan Publication: New Delhi, 2000. 3. Puri, B. R. and Sharma, L. R. <i>Principles of Physical Chemistry</i>, 38thed.; Vishal Publishing Company: Jalandhar, 2002. 4. Bruce, P. Y. and Prasad K. J. R. <i>Essential Organic Chemistry</i>, Pearson Education: New Delhi, 2008. 5. Dash UN, Dharmarha OP, Soni P.L. <i>Textbook of Physical Chemistry</i>, Sultan Chand & Sons: New Delhi, 2016
Reference Books	<ol style="list-style-type: none"> 1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, 4thed.; The Macmillan Company: New York, 1972. 2. Lee, J. D. <i>Concise Inorganic Chemistry</i>, 4th ed.; ELBS William Heinemann: London, 1991. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26thed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. <i>Physical Chemistry</i>, 10th ed.; Oxford University Press: New York, 2014. 5. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, 4th ed.; Addison, Wesley Publishing Company: India, 1993.

Website and e-learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/
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Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.	K1
CO2	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.	K2
CO3	Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electronegativity, percentage ionic character and bond order.	K4
CO4	Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects.	K5
CO5	Construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.	K6

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23U1CHCP1	Volumetric Analysis practical	3	3

Objectives of the course are to	<ul style="list-style-type: none"> acquire a practical knowledge on volumetric analysis find out hardness of water estimate the chlorine content in bleaching powder
Course Outline	<p>A. Acidimetry and alkalimetry</p> <ol style="list-style-type: none"> 1. Estimation of HCl by NaOH using a standard oxalic acid solution 2. Estimation of Na₂CO₃ by HCl using a standard Na₂CO₃ solution <p>B. Permanganometry</p> <ol style="list-style-type: none"> 3. Estimation of oxalic acid by KmnO₄ using a standard oxalic acid solution 4. Estimation of Iron (II) sulphate by KmnO₄ using a standard Mohr's salt solution. <p>C. Dichrometry</p> <ol style="list-style-type: none"> 6. Estimation of KMnO₄ by thio using a standard K₂Cr₂O₇ solution. 7. Estimation of Fe (III) by using K₂Cr₂O₇ using a standard Mohr's salt solution using internal and external indicators (not for examination). 8. Estimation of copper (II) sulphate by K₂Cr₂O₇ solution <p>D. Applied Experiments (not for examination)</p> <ol style="list-style-type: none"> 9. Estimation of Total Hardness of water 10. Estimation of available Chlorine in Bleaching Powder 11. Estimation of chloride ion in neutral solution
Reference Books	<ol style="list-style-type: none"> 1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997) 2. Dr.Murugan,Former Head, Department of Chemistry , Micro scale Analysis procedure –Material (2012)

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	acquire a practical knowledge on volumetric analysis	
CO2	find out hardness of water	
CO3	estimate the chlorine content in bleaching powder	
CO4	gain knowledge on Dichrometry titration	
CO5	Estimate the chloride ions in neutral solution	

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23U1CHMAA1	ALLIED MATHEMATICS – I	5	3

Nature of the course

Employability Oriented	✓	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented		Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	✓	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	✓	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

- 1.To introduce the concept of binomial, exponential and logarithmic series.
- 2.To teach the relation between circular and hyperbolic function
3. To impart the knowledge of the methods to find radius of curvature and centre of curvature

SYLLABUS		
Unit	Content	No. of Hours
I	Algebra: Binomial series - Application of Binomial theorem to the summation of series - Exponential series - summation of series using exponential series.	15
II	Theory of Equations: Nature of roots – Relation between the coefficients and the roots of an algebraic equation – Transformation of equations – Reciprocal Equations.	15
III	Matrices: Eigen values and eigen vectors – Diagonalisation – similar matrices – Cayley-Hamilton theorem. <i>Self-study: Eigen values for symmetric matrices</i>	15
IV	Trigonometry: Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ – Powers of Sines and Cosines of θ in terms of multiples of θ – expansion of $\sin\theta$ and $\cos\theta$ in a series of ascending powers of θ .	15
V	Differential Calculus: Curvature – circle, radius and centre of curvature – Cartesian formula for radius of curvature – coordinates of centre of curvature - parametric form.	15

***Note:** Questions may be asked from the *Self-study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

Ancillary Mathematics, Volume-I, S. Narayanan, R. HanumanthaRao, T.K.ManikavachagamPillay, S. Viswanathan Printers Pvt. Ltd., 2013.

Unit	Chapter	Sections
I	Chapter 1	Pages : 7 to 17, 28 to 37 Sec : 1.2, 1.3
II	Chapter 2	Pages:59 to 83 Sec : 2.1 to 2.4
III	Chapter 3	Pages: 151 to 160, Sec: 3.4 to 3.5
IV	Chapter 5	Pages : 220 to 239, Sec. 5.1 to 5.3
V	Chapter 6	Pages: 296 to 309, Sec : 6.4

References:

1. *Allied Mathematics, Paper-I, First Semester*, P.Kandasamy and K.Thilagavathy, S.Chand& Company Pvt. Ltd., New Delhi, 2014.
2. *Algebra Volume I*, T.K.M. Pillay, T. Natarajan and K.S.Ganapathy
3. *Calculus Volume I*, S. Narayanan and T.K. Manikavachagam

Web Resources:

1. <https://archive.nptel.ac.in/courses/111/106/111106148/>
2. <https://www.youtube.com/watch?v=prsgofH2EoU>
3. <https://www.cuemath.com/radius-of-curvature-formula/>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes

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

CO Number	CO Statement	Cognitive Level
CO1	Know the different types of series and its applications	K2,K4
CO2	Classify the relation between the coefficients and the roots of the algebraic equations	K3,K4
CO3	Solve the problems using Eigen values and Eigen vectors	K1,K3
CO4	Evaluate the problems of power series expansions	K2,K5
CO5	Classify the method of finding envelopes, curvature and Cartesian formula for radius of curvature	K3,K4

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 –Analyze, K5 –Evaluate, K6-Create

Mapping of Course Outcomes with Programme Outcomes

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	3	3	3	3
CO2	2	3	2	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	2	3	3	2	3

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

Mapping of Course Outcomes with Programme Specific Outcomes

CO \ PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	3	2	3	3	3	3	3
CO2	2	3	2	3	3	3	3	3
CO3	3	2	2	3	2	3	3	2
CO4	3	2	3	3	3	3	1	2
CO5	1	3	2	1	3	2	3	1

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I	23U1CHZO A1	ALLIED ZOOLOGY – I (Diversity of Invertebrates and Chordates)	5	4

Nature of the Course

Relevant to Local need		Employability Oriented		Addresses Professional Ethics	
Relevant to national need		Entrepreneurship Oriented		Addresses Gender Sensitization	
Relevant to regional need		Skill development Oriented	√	Addresses Environment and Sustainability	√
Relevant to Global need	√			Addresses Human Values	

Course Objectives:

The main objectives of this course are to:

1	To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida
2	To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata
3	To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia
4	To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia
5	To acquire detailed knowledge of select invertebrate and chordate forms

SYLLABUS

Unit	Content	No. of Hours
I	Diversity of Invertebrates–I Principles of taxonomy. Criteria for classification–Binomial nomenclature. General characters and Classification of Protozoa, Coelenterata, Helminthes and Annelida up to classes with two examples.	15 Hrs
II	Diversity of Invertebrates–II General characters and Classification of Arthropoda, Mollusca and Echinodermata up to class level with two examples.	15 Hrs
III	Diversity of Chordates–I General characters and Classification of Prochordata, Pisces and Amphibia up to orders with two examples.	15 Hrs
IV	Diversity of Chordates–II General characters and Classification of Reptilia, Aves and Mammalia up to orders with two examples.	15 Hrs

V	Animal organization: Detailed study: Structure and organization of (i) Earthworm (ii) Fish (iii) Rabbit	15 Hrs
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Text Books

1. Ekambaranatha Ayyar and T.N. Ananthakrishnan, (1992), Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai.
2. Kotpal, R.L. (2019-2020). A Modern Text Book of Zoology; Invertebrates, Rastogi publications XI Edition.
3. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Invertebrates. Saras Publication, Nagercoil.
4. Kingsley, J. S. (2015). Text Book of Vertebrate Zoology. United States: FB&C Limited.
5. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Chordate. Saras Publication, Nagercoil Vol II

References Books

1. E.L.Jordan & DR. P.S. Verma, (2019) Chordate Zoology, S Chand Publishers, New Delhi.
2. Kotpal, R.L. (2009-2010). A Modern Text Book of Zoology; vertebrates, Rastogi publications XI Edition
3. Jordon, E. L. and Verma, P. S. (1995). Invertebrate Zoology. S. Chand and Co, Zoology Delhi.
4. Barnes (2006) Invertebrate Zoology. Toppan International Co.
5. Yapp, W.B., 1965. Vertebrates, Their structure and life, Oxford University Press, New York, U.S.A.

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com

Pedagogy: Lecture, Assignment, PPT presentation

Course Outcomes

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

CO No.	CO Statement	CO Cognitive level
CO1	Recall the characteristic features invertebrates and chordates.	K1
CO2	Classify invertebrates up to class level and chordates up to order level	K4
CO3	Explain and discuss the structural and functional organisation of some invertebrates and chordates	K2
CO4	Relate the adaptations and habits of animals to their habitat	K2
CO5	Analyse the taxonomic position of animals.	K4

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes:										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	3	3	3
CO2	3	3	2	3	3	3	2	2	3	2
CO3	3	2	2	3	3	3	3	2	3	3
CO4	2	2	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	2	3	2

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I & II	23U2CHMAA2	ALLIED MATHEMATICS II (NS)	3+3	--

Nature of the course

Employability Oriented		Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented		Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. To understand the concepts correlation and regression
2. To acquire skills in the techniques of numerical solution of differential equations
3. To learn the computational methods of double and triple integrals

SYLLABUS

Unit	Content	No. of Hours
I	Correlation and Regression: Karl Pearson coefficient of correlation – Regression coefficients – Properties of regression coefficients <i>Self-study: Rank correlation</i>	18
II	Interpolation: Gregory Newton forward interpolation formula - Backward interpolation formula– Lagrange’s interpolation formula – Inverse interpolation (<i>no proofs, simple problems only</i>).	18
III	Numerical solution of ordinary differential equation: Euler’s method – Improved Euler’s method - Modified Euler’s method – Runge-Kutta method (4 th order only).	18
IV	Multiple integral: Double integral – Evaluation of double integral - change of order of integration – Polar coordinates - Triple integrals	18
V	Beta and Gamma Functions: Definitions – Convergence of $\Gamma(n)$ – Recurrence formula of gamma function – Properties of beta function – Relation between beta and gamma functions - Problems.	18

***Note:** Questions may be asked from the *Self-study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

1. *Fundamentals of Mathematical Statistics*, S.C. Gupta, V. K. Kapoor, Sulthan, 2002.
2. *Numerical methods*, P. Kandasamy, Thilagavathi and Gunavathi
3. *Calculus Vol II : T.K. M. Pillai*, 2015

Unit	Text Book	Chapter	Sections	Pages
I	1	X	Sec: 10.2 - 10.17	
		XI	Sec: 11.2–11.12	
II	2	VI	Sec: 6.1–6.3	209 – 225
		VIII	Sec: 8.7	271 - 276
III	2	XI	Sec: 11,9,11.11-11.13	369 -289
IV	3	V	Sec: 2 – 4	203 - 222
V	3	VII	Sec: 2 - 5	278 - 290

References:

1. Statistics - M. Sivathanupillai
2. Ancillary Maths - P.R.,Vittal, Margam Publications.

Web Resources:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC374386/#:~:text=Correlation%20quantifies%20the%20strength%20of,the%20form%20of%20an%20equation.>
2. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004032250572068siddharth_bhatt_engg_Numerical_Solution_of_Ordinary_Differential_Equations.pdf
3. <https://www.maths.tcd.ie/~richardt/2E1/2E1-ch3.pdf>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar.Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes

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

CO Number	CO Statement	Cognitive Level
CO1	State definitions and relevant concepts	K1
CO2	Compare exact solution and numerical solution	K2
CO3	Solve ordinary differential equations numerically	K3
CO4	Compute correlation and regression coefficients	K4
CO5	Evaluate double and triple integrals	K5

Cognitive Level:K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	3	2	3	3
CO2	3	2	3	2	3	2	3
CO3	2	3	2	3	2	1	3
CO4	3	3	1	2	3	2	3
CO5	1	3	3	3	2	3	1

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

Mapping of Course Outcomes with Programme Specific Outcomes

CO \ PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	3	3	2	3	3	3	3	3
CO2	2	3	2	3	3	3	3	3
CO3	1	2	2	3	2	3	3	1
CO4	3	2	1	1	3	3	1	2
CO5	2	3	2	2	3	2	3	2

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I & II	23U2CHZOAPL	ALLIED ZOOLOGY PRACTICAL (NS)	3	2

Course Objectives:

The main objectives of this course are to:

1	To acquire a basic knowledge of laboratory techniques in related to Zoology
2	To acquire a basic knowledge of taxonomic position, body organization and evolutionary relationship of species
3	To inculcate the significance of various invertebrates and chordates in their ecosystem
4	To comprehend the basic concepts of human genetics and patterns of inheritance
5	students to learn basic concepts of embryological studies, immunity and the working of immune organs

DISSECTION OF INVERTEBRATES:

1. Earth worm-Digestive system and Nervous system.
2. Cockroach – Digestive System, Nervous system and Reproductive system.
3. Freshwater mussel – Digestive system.

DISSECTION OF CHORDATA (virtual dissection)

Video clipping of Arterial and Venous system of Frog.

Dissection – Digestive system of fish

MOUNTING:

1. Earthworm - body setae and penial setae.
2. Mouth parts – honeybee, cockroach and mosquito
3. Fish - Placoid scales of shark and Brain of fish

Physiology: Sphygmomanometer, Stethoscope, Hemocytometer

Embryological slides: 24 Hour Chick Embryo, 48 Hour Chick Embryo, 72 Hour Chick Embryo, 96 Hour Chick Embryo.

Genetics:

1. Identification of ABO blood group.
2. Identification of male and Female *Drosophilla*,

Immunology:

Lymphoid organs of Rat.

SPOTTERS:

Invertebrata: Paramecium, Trypanosoma, Plasmodium, Leucosolenia, Sycon sponge, Aurelia, Obelia, Planaria, Liver fluke, Tapeworm, Ascaris, Leech, Earthworm, Nereis, Cockroach, Prawn Fresh water mussel, Star fish. **Protochordata and Vertebrata:** Amphioxus, Balanoglossus, Shark, Frog, Salamander, Calotes, Chamaeleon, Cobra, Pigeon, Rabbit.

Text Book:

1. Kotpal, R.L. (2019-2020). A Modern Text Book of Zoology; Invertebrates, Rastogi publications XI Edition
2. Ekambaranatha Ayyar and T.N. Ananthakrishnan, (1992), Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai.
3. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Chordate. Saras Publication, Nagercoil Vol II

4. Ahsan, J. and Sinha, S.P. (2010). A hand book on Economic Zoology. S. Chand & Co.,

Reference:

1. Verma, P. S. (2013). A Manual of Practical Zoology of Invertebrates. S. Chand of company Ltd, New Delhi.
2. Ekambaranatha AYYAR and Ananthakrishnan, T. N. (2009). Manual of Zoology Vol – II. S. Viswanathan Pvt. Ltd. Chennai.
3. De Iuliis, G. and Pulera, D. (2006). The Dissection of Vertebrates: A Laboratory Manual. Netherlands: Elsevier Science.
4. S. N. Prasad, M. Sc., D. Phil. Lecturer In Zoology, University of Allahabad. And P. V. Rajamannar, M. Sc. Zoology Department, qniversi~y of Delhi.,Laboratory Manual of Vertebrate Zoology . (For B. Sc. Students), Allahabad. Universal book company 20, mahatma gandhi marg.
5. Verma P.S.&Agarwal Developmental Biology, Chordata embryology S.Chand & Co.
6. Gupta G. K., 2013. Genetics Classical to Modern, Rastogi publishers, Meerut.
7. Singh, H.R and Kumar, N. 2017. Animal physiology and biochemistry, Vishal publishing company, Jalandhar, 864 pp.
8. Coleman, R.M., 2014. Fundamental Immunology, 2nd Edition, Published by Mc Graw Hill Education India, 357 pp.

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com

Pedagogy: Dissection, Mounting Videoclipping,

Course Outcomes

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

CO No.	CO Statement	CO Cognitive level
CO1	Recall the characteristic features invertebrates and chordates.	K1
CO2	Classify invertebrates up to class level and chordates up to order level	K3
CO3	Analyse the different developmental stages	K4
CO4	Analyse the working of body and immune systems	K4
CO5	Analyse the identification of blood grouping and Genetical studies	K4

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes:										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	3	3	3
CO2	3	3	2	3	3	3	2	2	3	2
CO3	3	2	2	3	3	3	3	2	3	3
CO4	2	2	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	2	3	2

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
II	23U2CHT2	வொதுத் தமிழ் - 2	6	3

Nature of the Course

1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது	✓	7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல்	
2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது		8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது	✓
3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது	✓	9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது	
4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல்		10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது	
5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல்		11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது	
6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல்	✓		

Course Objectives

- சமய இலக்கியங்களையும் சிற்றிலக்கியங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
- மாணவர்களுக்கு மொழித்திறனை வளர்க்கப் பயிற்சி அளித்தல்.
- மாணவர்களுக்குச் சிறுகதை இலக்கிய வடிவத்தை உணர்த்துதல்.

Unit	Details	Hours
Unit-I	1. திருநாவுக்கரசர் தேவாரம் - நாமார்க்கும் குடியல்லோம் எனத் தொடங்கும் பதிகம் (10 பாடல்கள்) 2. ஆண்டாள் - திருப்பாவை (முதல் 10 பாசரம்)	18 Hrs
Unit-II	1. வள்ளலார் - அருள் விளக்க மாலை (முதல் 10 பாடல்) 2. எச். ஏ. கிருட்டிணப்பிள்ளை - இரட்சணிய மனோகரம் - பால்ய பிரார்த்தனை 3. குணங்குடி மஸ்தான் சாகிபு - பராபரக்கண்ணி (முதல் 10 கண்ணி)	18 Hrs
Unit-III	சிற்றிலக்கியங்கள் 1. தமிழ்விடு தூது (முதல் 20 கண்ணி) 2. திருக்குற்றாலக் குறவஞ்சி - குறத்தி மலைவளம் கூறுதல் 3. முக்கூடல் பள்ளு - நாட்டு வளம்	18 Hrs
Unit-IV	1. பாடம் தழுவிய இலக்கிய வரலாறு 2. மனோரஞ்சிதம் - கேட்டிவி	18 Hrs

Unit-V	மொழித்திறன்/போட்டித் தேர்வுத் திறன் 1. தொடர் வகைகள் 2. மரபுத்தொடர், பழமொழிகள் 3. பிறமொழிச் சொற்களைக் களைதல் 4. வழிச்சொற்கள் நீக்குதல் 5. இலக்கணக் குறிப்பு அறிதல்	18 Hrs
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CO Number	CO Statement	Cognitive Level
CO1	பக்தி இலக்கியங்களைக் கற்பதன் மூலம் பக்தி நெறியினையும், சமய நல்லிணக்கத்தையும் தெரிந்து பின்பற்றுவர்.	K1, K2
CO2	சிற்றிலக்கியங்களின்வழி இலக்கியச் சுவையினையும் பண்பாட்டு அறிவினையும் பெறுவர்.	K2
CO3	பட்டப் படிப்பினைப் படிக்கும் போதே பெரும்பான்மையான தமிழ் இலக்கியங்கள் குறித்த அறிவினைப் பெறுவர்.	K4
CO4	தமிழ்ச் சமூகப் பண்பாட்டு வரலாற்றினை இலக்கியங்கள் வாயிலாக அறிவர்.	K3
CO5	போட்டித் தேர்வுகளில் வெற்றி பெறுவதற்குத் தமிழ்ப் பாடத்தினைப் பயன்கொள்ளும் வகையில் ஏற்ற பயிற்சி பெறுவர்.	K4

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ் பார்வை நூல்கள்

1. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்
2. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழ்ணணல்
3. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resource

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

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

பொதுத்தமிழ் —2												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	2	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	3	3	2	2	2	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23U2CHE2	PART - II GENERAL ENGLISH	6	3

Learning Objectives		
LO1	To make students realize the importance of resilience	
LO2	To enable them to become good decision makers	
LO3	To enable them to imbibe problem-solving skills	
LO4	To enable them to use tenses appropriately	
LO5	To help the student use English effectively at the work place.	
Unit No.	Unit Title & Text	No. of Periods for the Unit
I	RESILIENCE Poem Don't Quit – Edgar A. Guest Still Here – Langston Hughes Short Story Engine Trouble – R.K. Narayan Rip Van Winkle – Washington Irving	20
II	DECISION MAKING Short Story The Scribe – Kristin Hunter The Lady or the Tiger – Frank Stockton Poem The Road not Taken – Robert Frost Snake – D. H. Lawrence	20
III	PROBLEM SOLVING Prose life Story How I taught My Grandmother to Read – Sudha Murthy Autobiography How frog Went to Heaven – A Tale of Angolo Wings of Fire (Chapters 1, 2, 3) by A.P.J Abdul Kalam	20
IV	Moral Values The Stoic Penalty Nobility in Reasoning Malu, the Frivolous Freak Honesty is the Cream of Chastity A Boy in Boy's Town	15
V	Tenses Present Past Future Concord	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Realize the importance of resilience	PO1,PO7
CO2	Become good decision-makers	PO1,PO2,PO10
CO3	Imbibe problem-solving skills	PO4,PO6,PO9
CO4	Use tenses appropriately	PO4, PO5,PO6
CO5	Use English effectively at the work place.	PO3,PO8

Text Books (Latest Editions)

References Books	
1	Martin Hewings. Advanced English Grammar. Cambridge University Press, 2000
2	SP Bakshi, Richa Sharma. Descriptive English. Arihant Publications (India) Ltd., 2019.
3.	Sheena Cameron, Louise Dempsey. The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing, 2019.
4	Barbara Sherman. Skimming and Scanning Techniques, Liberty University Press, 2014.
5.	Phil Chambers. Brilliant Speed Reading: What every ounded to read, however. Pearson, 2013.
6.	Communication Skills: Practical Approach Ed.Shaikh Moula Ramendra Kumar. Stories of Resilience, Blue Rose Publications, 2020.
7.	Sri.KTV.Melodious Harmony, New Century Book House. 2022

Web Sources

1	LangstonHughes.StillHere https://poetryace.com/im-still-here
2	R.K. Narayan.Engine Trouble http://www.sbioaschooltrichy.org/work/Work/images/new/8e.pdf
3	Washington Irving. Rip Van Winkle https://www.gutenberg.org/files/60976/60976-h/60976-h.htm
4	FrankStockton. TheLadyor the Tiger https://www.gutenberg.org/ebooks/396

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3–Strong, 2–Medium,1-Low Mapping with Programme Specific Outcomes:

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

3– Strong, 2 –Medium, 1-Low

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23U2CHC2	GENERAL CHEMISTRY-II	5	4
Objectives of the course	This course aims at providing an overall view of the <ul style="list-style-type: none"> • chemistry of acids, bases and ionic equilibrium • properties of s and p-block elements • chemistry of hydrocarbons • applications of acids and bases • compounds of main block elements and hydrocarbons 			
Course Outline	<p>UNIT-I Acids, bases and Ionic equilibria Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis; Solubility product - determination and applications; numerical problems involving the core concepts.</p> <p>Unit-II Chemistry of s - Block Elements Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na₂CO₃, KBr, KClO₃ alkaline earth metals. Anomalous behaviour of Be.</p> <p>Chemistry of p- Block Elements (Group 13 & 14) preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.</p>			
	<p>UNIT-III Chemistry of p- Block Elements (Group 15-18) General characteristics of elements of Group 15; chemistry of H₂N-NH₂, NH₂OH, HN₃ and HNO₃. Chemistry of PH₃, PCl₃, PCl₅, POCl₃, P₂O₅ and oxy acids of phosphorous (H₃PO₃ and H₃PO₄).</p> <p>General properties of elements of group 16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).</p> <p>Chemistry of Halogens: General characteristics of halogen with reference to electronegativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids (HClO₄). Inter-halogen compounds (ICl, ClF₃, BrF₅ and IF₇), pseudo halogens [(CN)₂ and (SCN)₂] and basic nature of Iodine.</p> <p>Noble gases: Position in the periodic table. Preparation, properties and</p>			

	<p>structure of XeF₂, XeF₄, XeF₆ and XeOF₄; uses of noble gases - clathrate compounds.</p>
	<p>UNIT-IV Hydrocarbon Chemistry-I Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses</p> <p>Alkenes-Nomenclature, general methods of preparation – Mechanism of β- elimination reactions – E₁ and E₂ mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.</p> <p>Alkadienes Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.</p> <p>Alkynes Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.</p> <p>Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.</p>
	<p>UNIT-V Hydrocarbon Chemistry - II Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.</p> <p>Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at □ - position – reduction, oxidation – uses.</p> <p>Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded, S.Chand and Company, New Delhi. 2. Sathya Prakash, Tuli G D, Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi. 3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi. 4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi. 5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.

Reference Books	<ol style="list-style-type: none"> 1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork. 2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, NewDelhi. 3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London. 4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India. 5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed., Goel Publishing House, Meerut. 6. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry, 8thed., Goel Publishing House, Meerut.
Website and e-learning source	<p>https://onlinecourses.nptel.ac.in/http://cactus.dixie.edu/smlack/chem1010/lecture_notes/4B.html</p> <p>http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atOMIC-structure-and-chemical-bonding</p> <p>MOOC components</p> <p>http://nptel.ac.in/courses/104101090/</p> <p>Lecture 1: Classification of elements and periodic properties</p> <p>http://nptel.ac.in/courses/104101090/</p>

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons	
CO2	Discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids.	
CO3	Classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons	
CO4	Explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements.	
CO5	Assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons	

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23U2CHCP2	Organic qualitative analysis and physical constants	5	4
Objectives of the course		<ul style="list-style-type: none"> Students learn the techniques of organic qualitative analysis. Students learn the determination of physical constants of organic compounds. 		
Course Outline		<p>A. Organic qualitative analysis Systematic analysis of an organic compound - Preliminary tests, detection of the element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests and derivatives for the given organic compounds.</p> <p>B. Physical constants: Determination of physical constants (boiling point and melting point) of the given organic compound.</p>		
Recommended Text		1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)		

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	learn the techniques of organic qualitative analysis.	K1
CO2	learn the determination of physical constants of organic compounds.	K3
CO3	Detect the element present in a compounds	K2
CO4	Find out the functional group	K5
CO5	prepare the derivatives of functional group	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I & II	23U2CHMAA2	ALLIED MATHEMATICS – II (NS)	3+3	3

Nature of the course

Employability Oriented		Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented		Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	√	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	√	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. To understand the concepts correlation and regression
2. To acquire skills in the techniques of numerical solution of differential equations
3. To learn the computational methods of double and triple integrals

SYLLABUS

Unit	Content	No. of Hours
I	Correlation and Regression: Karl Pearson coefficient of correlation – Regression coefficients – Properties of regression coefficients <i>Self-study: Rank correlation</i>	18
II	Interpolation: Gregory Newton forward interpolation formula - Backward interpolation formula– Lagrange’s interpolation formula – Inverse interpolation (<i>no proofs, simple problems only</i>).	18
III	Numerical solution of ordinary differential equation: Euler’s method – Improved Euler’s method - Modified Euler’s method – Runge-Kutta method (4 th order only).	18
IV	Multiple integral: Double integral – Evaluation of double integral - change of order of integration – Polar coordinates - Triple integrals	18
V	Beta and Gamma Functions: Definitions – Convergence of $\Gamma(n)$ – Recurrence formula of gamma function – Properties of beta function – Relation between beta and gamma functions - Problems.	18

***Note:** Questions may be asked from the *Self-study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

1. *Fundamentals of Mathematical Statistics*, S.C. Gupta, V. K. Kapoor, Sulthan, 2002.
2. *Numerical methods*, P. Kandasamy, Thilagavathi and Gunavathi
3. *Calculus Vol II* : T.K. M. Pillai, 2015

Unit	Text Book	Chapter	Sections	Pages
I	1	X	Sec: 10.1 - 10.4	10.2 – 10.12
		XI	Sec: 11.1–11.2	11.2 – 11.12
II	2	VI	Sec: 6.1–6.6	209 – 225
		VIII	Sec: 8.7	271 – 278
III	2	XI	Sec: 11.9, 11.3	369 -389
IV	3	V	Sec: 2 – 4	203 - 222
V	3	VII	Sec: 2 - 5	278 - 290

References:

1. Statistics - M. Sivathanupillai
3. Ancillary Maths - P.R., Vittal, Margam Publications.

Web Resources:

4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC374386/#:~:text=Correlation%20quantifies%20the%20strength%20of,the%20form%20of%20an%20equation.>
5. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004032250572068siddharth_bhatt_engg_Numerical_Solution_of_Ordinary_Differential_Equations.pdf
6. <https://www.maths.tcd.ie/~richardt/2E1/2E1-ch3.pdf>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar, Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes

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

CO Number	CO Statement	Cognitive Level
CO1	State definitions and relevant concepts	K1
CO2	Compare exact solution and numerical solution	K2
CO3	Solve ordinary differential equations numerically	K3
CO4	Compute correlation and regression coefficients	K4
CO5	Evaluate double and triple integrals	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	3	2	3	3
CO2	3	2	3	2	3	2	3
CO3	2	3	2	3	2	1	3
CO4	3	3	1	2	3	2	3
CO5	1	3	3	3	2	3	1

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

Mapping of Course Outcomes with Programme Specific Outcomes

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
CO1	3	3	2	3	3	3	3	3
CO2	2	3	2	3	3	3	3	3
CO3	1	2	2	3	2	3	3	1
CO4	3	2	1	1	3	3	1	2
CO5	2	3	2	2	3	2	3	2

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

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
I & II	23U2CHZOAPL	ALLIED ZOOLOGY PRACTICAL (NS)	3	3

Course Objectives:

The main objectives of this course are to:

1	To acquire a basic knowledge of laboratory techniques in related to Zoology
2	To acquire a basic knowledge of taxonomic position, body organization and evolutionary relationship of species
3	To inculcate the significance of various invertebrates and chordates in their ecosystem
4	To comprehend the basic concepts of human genetics and patterns of inheritance
5	students to learn basic concepts of embryological studies, immunity and the working of immune organs

DISSECTION OF INVERTEBRATES:

1. Earth worm-Digestive system and Nervous system.
2. Cockroach – Digestive System, Nervous system and Reproductive system.
3. Freshwater mussel – Digestive system.

DISSECTION OF CHORDATA (virtual dissection)

Video clipping of Arterial and Venous system of Frog.

Dissection – Digestive system of fish

MOUNTING:

6. Earthworm - body setae and penial setae.
7. Mouth parts – honeybee, cockroach and mosquito
8. Fish - Placoid scales of shark and Brain of fish

Physiology: Sphygmomanometer, Stethoscope, Hemocytometer

Embryological slides: 24 Hour Chick Embryo, 48 Hour Chick Embryo, 72 Hour Chick Embryo, 96 Hour Chick Embryo.

Genetics:

1. Identification of ABO blood group.
2. Identification of male and Female *Drosophilla*,

Immunology:

Lymphoid organs of Rat.

SPOTTERS:

Invertebrata: Paramecium, Trypanosoma, Plasmodium, Leucosolenia, Sycon sponge, Aurelia, Obelia, Planaria, Liver fluke, Tapeworm, Ascaris, Leech, Earthworm, Nereis, Cockroach, Prawn Fresh water mussel, Star fish. **Protochordata and Vertebrata:** Amphioxus, Balanoglossus, Shark, Frog, Salamander, Calotes, Chamaeleon, Cobra, Pigeon, Rabbit.

Text Book:

1. Kotpal, R.L. (2019-2020). A Modern Text Book of Zoology; Invertebrates, Rastogi publications XI Edition
2. Ekambaranatha Ayyar and T.N. Ananthkrishnan, (1992), Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai.
3. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Chordate. Saras Publication, Nagercoil Vol II

4. Ahsan, J. and Sinha, S.P. (2010). A hand book on Economic Zoology. S. Chand & Co.,

Reference:

1. Verma, P. S. (2013). A Manual of Practical Zoology of Invertebrates. S. Chand of company Ltd, New Delhi.
2. Ekambaranatha AYYAR and Ananthkrishnan, T. N. (2009). Manual of Zoology Vol – II. S. Viswanathan Pvt. Ltd. Chennai.
3. De Iuliis, G. and Pulera, D. (2006). The Dissection of Vertebrates: A Laboratory Manual. Netherlands: Elsevier Science.
4. S. N. Prasad, M. Sc., D. Phil. Lecturer In Zoology, University of Allahabad. And P. V. Rajamannar, M. Sc. Zoology Department, qniversi~y of Delhi.,Laboratory Manual of Vertebrate Zoology . (For B. Sc. Students), Allahabad. Universal book company 20, mahatma gandhi marg.
5. Verma P.S.&AgarwalDevelopmentalBiology,ChordataembryologyS.Chand& Co.
6. Gupta G. K., 2013. Genetics Classical to Modern, Rastogi publishers, Meerut.
7. Singh, H.R and Kumar, N. 2017. Animal physiology and biochemistry, Vishal publishing company, Jalandhar, 864 pp.
8. Coleman,R.M., 2014. Fundamental Immunology, 2nd Edition, Published by Mc Graw Hill Education India, 357 pp.

Web-Resources:

3. www.sanctuaryasia.com
4. www.iaszoology.com

Pedagogy: Dissection, Mounting Videoclipping,

Course Outcomes

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

CO No.	CO Statement	CO Cognitive level
CO1	Recall the characteristic features invertebrates and chordates.	K1
CO2	Classify invertebrates up to class level and chordates up to order level	K3
CO3	Analyse the different developmental stages	K4
CO4	Analyse the working of body and immune systems	K4
CO5	Analyse the identification of blood grouping and Genetical studies	K4

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze;K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes:										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	2	3	3	3
CO2	3	3	2	3	3	3	2	2	3	2
CO3	3	2	2	3	3	3	3	2	3	3
CO4	2	2	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	2	3	2

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23U2CHMAA3	Allied Mathematics – III	5	3

Nature of the course

Employability Oriented	✓	Relevant to Local need		Addresses Gender Sensitization	
Entrepreneurship Oriented		Relevant to regional need		Addresses Environment and Sustainability	
Skill development Oriented	✓	Relevant to national need		Addresses Human Values	
		Relevant to Global development need	✓	Addresses Professional Ethics	

Course Objectives

The main objectives of this course are:

1. To introduce various methods to solve the partial differential solution.
2. To teach the concept of curl & divergence of vector field
3. To introduce the concept of Laplace transforms and Fourier series.

SYLLABUS		
Unit	Content	No. of Hours
I	Ordinary Differential Equation: Variable Separable – Homogeneous equations – Non – homogeneous equations of the first degree in x & y – Linear equation – Bernoulli’s equation – Exact differential of equations	15
II	Vector differentiation: Vector differential operator – Gradient – Direction and magnitude of gradient – Divergence and curl– Formulae involving operator ∇ .	15
III	Vector integration: Surface Integral –Guass Divergence theorem –Stoke’s theorem (without proof)	15
IV	Laplace Transforms: Definition – Results and proofs: Laplace Transform of functions $f(t) + g(t)$, $cf(t)$, $f'(t)$, $f''(t)$, e^{at} , $\cosh at$, $\sinh at$, $\cos at$, $\sin at$, t^n - some general theorems – Inverse transforms relating to the above standard forms - solution of ordinary differential equation with constant coefficients.	15
V	Fourier Series: Definition – finding Fourier coefficients for the given periodic function with period 2π - Even and odd functions – Properties of odd and even functions. <i>Self-study: Half range Fourier series</i>	15

***Note:** Questions may be asked from the *Self-study* content for only CIA test (Mid and End semesters) and **NOT** for the external (Semester Examinations)

Textbook:

Ancillary Mathematics, Volume-II, S. Narayanan, R. HanumanthaRao, T.K.ManicavachagomPillay, S. Viswanathan Printers Pvt. Ltd., 2015.

Unit	Chapter	Sections
I	Chapter 4	Pages : 205 to 225, Sec : 1 to 6
II	Chapter 8	Pages : 335 to 357, Sec : 16 to 21
III	Chapter 8	Pages : 377 to 389, 399 to 407, Sec : 5 to 6 & 9
IV	Chapter 7	Pages : 289 to 310, Sec : 1 to 5
V	Chapter 2	Pages : 123 to 143, Sec : 1 to 4

References:

1. *Engineering Mathematics – A Singaravelu(Volume I & II)*
2. *Vector Calculus – K.Viswannathan and S.Selvaraj*
3. *Ancillary Mathematics – P.R.Vittal, Margam Publications*

Web resources:

1. <https://archive.nptel.ac.in/courses/111/106/111106148/>
2. <https://www.youtube.com/watch?v=f5WNaV4nwiQ>
3. <https://youtu.be/rCw-FVegWJA>

Pedagogy: Teaching / Learning methods:

Chalk and Board, Virtual Class room, LCD projector, Video Conference, Guest Lectures, Tutorial, Assignment, Seminar. Library, Net Surfing, NPTEL Course Materials, Use of Mathematical software.

Course Outcomes

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

CO Number	CO Statement	Cognitive Level
CO1	Know the concept of homogeneous and non homogeneous equations of first degree in x and y	K2,K4
CO2	Classify the method of finding gradient ,divergence and curl	K4
CO3	Classify the method of Surface integral, Gauss Divergence and Stoke's theorems	K4
CO4	Solve the problems using Laplace and its inverse transforms	K4
CO5	Find the problems using Fourier series	K3,K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1		3	3	2	3	3	3	3
CO2		3	3	3	3	3	3	3
CO3		1	3	3	3	1	2	1
CO4		3	3	3	3	2	3	2
CO5		3	3	1	3	3	3	3

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

Mapping of Course Outcomes with Programme Specific Outcomes

CO	PSO	PSO 1	P SO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1		3	3	2	3	3	3	3	3
CO2		2	3	2	3	3	3	3	1
CO3		1	2	2	3	2	3	3	2
CO4		3	1	3	1	3	2	2	2
CO5		2	3	2	2	2	2	1	2

3 - Strongly Correlated; 2 - Moderately Correlated;
1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
II	23U2CHZOA2	ALLIED ZOOLOGY –II (Physiology, Embryology, Immunology, Human Genetics and Animal Behaviour)	5	3

Nature of the Course

Relevant to Local need		Employability Oriented	√	Addresses Professional Ethics	
Relevant to national need		Entrepreneurship Oriented	√	Addresses Gender Sensitization	
Relevant to regional need		Skill development Oriented		Addresses Environment and Sustainability	√
Relevant to Global need	√			Addresses Human Values	

Course Objectives:

The main objectives of this course are to:

1	To enable students to learn basic concepts relating to aspects of respiratory, circulatory, excretory nervous and sensory physiology.
2	To enable students to comprehend the processes involved during development
3	To enable students to learn basic concepts of immunity and the working of immune organs and familiarize them with the recommended vaccination schedule
4	To enable students to comprehend the basic concepts of human genetics and patterns of inheritance
5	To enable students to learn about aspects of animal behaviour such as foraging, courtship, nest construction, parental care and learning

SYLLABUS

Unit	Content	No. of Hours
I	Physiology: Respiration - Respiratory pigments and transport of gases. Mechanism of blood clotting. Types of excretory products – Ornithine cycle. Structure of neuron – Conduction of nerve impulse -Physiology of vision and hearing.	15 Hrs
II	Embryology: Fertilization, Cleavage, Pattern of Cleavage, Gastrulation of frog and Organogenesis of Frog eye – Extra embryonic membrane in Chick - Placentation in mammals.	15 Hrs
III	Immunology: Innate and Acquired - Active and Passive; Antigens and Antibodies; Types of Immunoglobulins -Immunological organs – Vaccination schedule.	15 Hrs
IV	Human Genetics: Human Chromosomes – Sex Determination in Humans - Patterns of Inheritance - Autosomal Dominant, Autosomal Recessive, X-linked, Y-linked, Mitochondrial, Multiple Alleles- Genetic Counselling	15 Hrs

V	Animal Behaviour: Foraging, Courtship Behaviour, Shelter and Nest Construction, Parental Care in Fish and Amphibia, Learning Behaviour.	15 Hrs
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Text Book:

1. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.
2. Guptha G. K., 2013. Genetics Classical to Modern, Rastogi publishers, Meerut.
3. Singh, H.R and Kumar, N. 2017. Animal physiology and biochemistry, Vishal publishing company, Jalandhar, 864 pp.
4. Coleman, R.M., 2014. Fundamental Immunology, 2nd Edition, Published by Mc Graw Hill Education India, 357 pp.

References:

1. Owen, J. A., Punt, J. & Stranford, S. A. - Kuby Immunology. New York: W.H. Freeman & Company Klug, W. S., Cummings, M. R. & Spencer, C - Concepts of Genetics. (12th ed.). New Jersey: Pearson Education.
2. Mathur, R.- Animal Behaviour. Meerut: Rastogi.
3. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.
4. Cooper, Geoffrey M., 2018. The cell: A Molecular Approach, Eighth Edition, Oxford University Press.

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com
3. <https://www.ncbi.nlm.nih.gov/books/NBK10052/>
4. <https://www.genome.gov/genetics-glossary/Sex-Linked>

Pedagogy: Lecture, Assignment, PPT presentation,

Course Outcomes

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

CO No.	CO Statement	CO Cognitive level
CO1	Recall the parts and working of body organs and developmental stages, name the patterns of inheritance and list different types of animal behaviour	K1
CO2	Analyse the different developmental stages	K4
CO3	Analyse the working of body and immune systems	K4
CO4	Analyse the different patterns of inheritance	K4
CO5	Relate the behaviour of animals to physiology. Analyse the different types of behaviour	K2

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Mapping of Course Outcomes with Programme Outcomes:										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	2	2	3	1	3
CO2	3	3	2	3	3	3	2	2	2	2
CO3	3	2	2	3	3	2	3	2	3	3
CO4	2	2	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	1	3	2	3	2

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

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
III	23U3CHT3	வொதுத் தமிழ் - 3	6	3

Nature of the Course

1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது		7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல்	✓
2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது		8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது	✓
3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது	✓	9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது	
4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல்		10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது	
5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல்		11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது	
6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல்	✓		

Course Objectives

<p>1. இலக்கியங்களின் சிறப்பினை உணர்த்துதல்.</p> <p>2. காலந்தோறும் எழுந்த காப்பியங்களின் போக்கையும், புதினத்தின் இலக்கிய வடிவத்தை மாணவர்கள் உணருமாறு செய்தல்.</p> <p>3. யாப்பு, அணி போன்ற இலக்கிய வகைகளையும் மொழி பெயர்ப்புத் திறனையும் மாணவர்கள் உணருமாறு செய்தல்.</p> <p>4. தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்பக் கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.</p>

Unit	Details	Hours
Unit-I	பெருங்காப்பியங்கள் 1. சிலப்பதிகாரம் - வழக்குரைகாதை-இளங்கோவடிகள் 2. மணிமேகலை ஆதிரை பிச்சையிட்ட காதை சீத்தலைச்சாத்தனார் 3. சீவகசிந்தாமணி - பூமகள் இலம்பகம் திருத்தக்கதேவர் 4. வளையாபதி—நாதகுத்தனார்	18 Hrs
Unit-II	சமயக் காப்பியங்கள் 1. பெரியபுராணம் - பூசலார் நாயனார்புராணம்-சேக்கிழார் 2. கம்பராமாயணம்- மந்தரை சூழ்ச்சிப் படலம்-கம்பர் 3. வில்லிபாரதம் - மற்போர் சருக்கம்-வில்லிப்புத்தூராழ்வார் 4. சிறாப்புராணம் - புலி வசனித்த படலம்-உறுப்புலவர்	18 Hrs
Unit-III	புதினம்	18 Hrs

	1.வஞ்சிமாநகரம் (வரலாற்றுப் புதினம்) -நா. பார்த்தசாரதி	
Unit-IV	1.பாடம் தழுவிய இலக்கிய வரலாறு 2.குரல் கொடுக்கும் வானம்பாடி - கேட்டிவி	18 Hrs
Unit-V	மொழித்திறன்/போட்டித் தேர்வுத் திறன் 1. நூல் மதிப்புரை 2. திறனாய்வு செய்தல் 3. கடிதம் வரைதல் 4. விண்ணப்பம் எழுதுதல்	18 Hrs

CO Number	CO Statement	Cognitive Level
CO1	காப்பியங்கள் அறிமுகப்படுத்தப்படுவதால் தமிழ் மொழியின் உயர்வையும் சிறப்பையும் உணர்தல்.	K1, K2
CO2	தமிழ்ப் புதினங்களின்வழி சமகாலப் படைப்புகளின் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர்.	K2
CO3	நாவல் இலக்கியம் அறிமுகப்படுத்தப்படுவதால் சிந்தனை ஆற்றல், படைப்பாற்றல், கற்பனைத்திறன் வளர்தல்.	K4
CO4	யாப்பு, அணி இலக்கணங்கள், மொழிபெயர்ப்புத்திறன் ஆகியவற்றைக் கற்பதன் மூலம் போட்டித் தேர்வுகளை எதிர் கொள்ளுதல்.	K3
CO5	காப்பியங்கள் அறிமுகப்படுத்தப்படுவதால் தமிழ் மொழியின் உயர்வையும் சிறப்பையும் உணர்தல்.	K4

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ் பார்வை நூல்கள்
1. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்
2. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழ்ணணல்
3. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resources

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. [www.tamilvu.org/ library](http://www.tamilvu.org/library)
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <<http://www.chennailibrary.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- [tamale books downloads. blogspot.com](http://tamalebooksdownloads.blogspot.com)
7. Tamil Books on line- [books. tamil cube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

பொதுத்தமிழ் —3												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	2	3	2	2
CLO3	2	2	2	3	2	3	3	2	2	2	2	3
CLO4	3	2	2	2	3	2	3	3	2	3	3	3
CLO5	2	2	2	3	2	3	2	3	3	2	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23U3CHE3	PART - II GENERAL ENGLISH	6	3

Learning Objectives		
LO1	To make students realize the importance of resilience	
LO2	To enable them to become good decision makers	
LO3	To enable them to imbibe problem-solving skills	
LO4	To enable them to use senses appropriately	
LO5	To help the student use English effectively at the work place.	
Unit No.	Unit Title & Text	No. of Periods for the Unit
I	ACTIVE LISTENING Short Story Ina Grove–Akutagawa Ryunosuke Translated from Japanese by Takashi Kojima The Gift of the Magi – O’ Henry Prose Listening – Robin Sharma Nobel Prize Acceptance Speech – Wangari Maathai	20
II	INTERPERSONAL RELATIONSHIPS Prose Telephone Conversation–Wole Soyinka Of Friendship – Francis Bacon Songon (Motivational/ Narrative) Ulysses–Alfred Lord Tennyson And Still I Rise– Maya Angelou	20
III	COPING WITH STRESS Poem Leisure– W.H. Davies Anxiety Monster– Rhona McFerran Readers Theatre The Forty Fortunes: A Tale of Iran Where there is a Will–Mahesh Dattani	20
IV	Grammar Phrasal Verb & Idioms Modals and Auxiliaries Verb Phrases–Gerund, Participle, Infinitive	15
V	Composition/Writing Skills Official Correspondence–Leave Letter, Letter of Application, Permission Letter Drafting Invitations Brochures for Programmes and Events	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Listen actively	PO1,PO7
CO2	Develop interpersonal relationship skills	PO1,PO2,PO10
CO3	Acquire self-confidence to cope with stress	PO4,PO6,PO9
CO4	Master grammar skills	PO4,PO5,PO6
CO5	Carryout business communication effectively	PO3,PO8

Text Books (Latest Editions)

1	Wangari Maathai–Nobel Lecture. Nobel Prize Outreach AB 2023.Jul 2023.
2	Mahesh Dattani,Where there is W ill. Penguin, 2013.
3	Martin Hewings, Advanced English Grammar, Cambridge University Press, 2000
4	EssentialEnglishGrammarbyRaymondMurphy

WebResources

1	WangariMaathai–NobelLecture.NobelPrizeOutreachAB2023.Mon.17Jul 2023. https://www.nobelprize.org/prizes/peace/2004/maathai/lecture/
2	TelephoneConversation-Wole Soyinka https://www.k-state.edu/english/westmank/spring_00/SOYINKA.html
3	AnxietyMonster- RhonaMcFerran- www.poetrysoup.com

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3– Strong, 2– Medium, 1 -Low

Mapping with Programme Specific Outcomes:

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

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23U3CHC3	GENERAL CHEMISTRY – III	5	5
Objectives of the course	This course aims to provide a comprehensive knowledge on <ul style="list-style-type: none"> the physical properties of gases, liquids, solids and X-ray diffraction of solids. fundamentals of nuclear chemistry and nuclear waste management. applications of nuclear energy basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. preparation and properties of phenols and alcohols. 			
Course Outline	<p>UNIT I Gaseous state</p> <p>Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell – Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.</p> <p>Real gases: Deviations from ideal gas behaviour, (Andrew’s and Amagat’s plots); compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van der Waal’s equation; Virial equation; Boyle temperature; Numerical problems based on equations of states for real gases, isotherms of real gases – critical phenomena – isotherms of CO₂ - continuity of state–Van der waal’s equation and the critical state; law of corresponding states-liquefaction of gases; numerical problems involving the core concepts.</p>			
	<p>Unit-II Liquid and Solid State</p> <p>Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.</p> <p>Crystals –size and shape; laws of crystallography; symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg’s equation</p> <p>Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO₂; comparison of structure and properties of diamond and graphite; numerical problems involving core concepts</p> <p>Defects in solids - stoichiometric and nonstoichiometric defects.</p> <p>Liquid crystals – classification and applications.</p>			

	<p>UNIT-III Nuclear Chemistry Natural radioactivity - α, β and γ rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series. Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out) Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures..</p>
	<p>UNIT-IV Halogen derivatives Aliphatic halogen derivatives Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent. Di, Tri & Tetra Halogen derivatives: Nomenclature, classification, preparation, properties and applications. Aromatic halogen compounds Nomenclature, preparation, properties and uses Mechanism of nucleophilic aromatic substitution – benzyne intermediate. Aryl alkyl halides Nomenclature, benzyl chloride – preparation – preparation properties and uses Alcohols: Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.</p>
	<p>UNIT-V Phenols Nomenclature; classification, Preparation from diazonium salts, cumene, Dow’s process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions – Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction. Resorcinol, quinol, picric acid – preparation, properties and uses. Aromatic alcohols Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses. Thiols: Nomenclature, structure, preparation and properties.</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. B.R. Puri, L.R. Sharma, M.S. Pathania; <i>Principles of Physical Chemistry</i>, 46th edition, Vishal Publishing, 2020. 2. B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i>, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009. 3. 4. P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, SultanChand & amp; Sons, twentieth edition, 2006. 4. M. K. Jain, S. C. Sharma, <i>Modern Organic Chemistry</i>, Vishal Publishing, fourth reprint, 2003. 5. S.M. Mukherji, and S.P. Singh, <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., third edition, 1994.

Reference eBooks	<ol style="list-style-type: none"> 1. T. W. Graham Solomons, <i>Organic Chemistry</i>, John Wiley & Sons, fifth edition, 1992. 2. A. Carey Francis, <i>Organic Chemistry</i>, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, seventh edition, 2009. 3. I. L. Finar, <i>Organic Chemistry</i>, Wesley Longman Ltd, England, sixth edition, 1996. 4. P. L. Soni, and H. M. Chawla - <i>Text Book of Organic Chemistry</i>, New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007. 5. J.D. Lee, <i>Concise Inorganic Chemistry</i>, Blackwell Science, fifth edition, 2005.
Website and e-learning source	MOOC components https://nptel.ac.in/courses/104104101 Solid state chemistry https://nptel.ac.in/courses/103106071 Nuclear industries and safety https://nptel.ac.in/courses/104106119 Introduction to organic chemistry

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain the kinetic properties of gases by using mathematical concepts.	K1
CO2	describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.	K2
CO3	investigate the radioactivity, nuclear energy and its production, also the nuclear wastemanagement.	K3
CO4	write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.	K4
CO5	investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23U3CHCP3	Inorganic Qualitative Analysis	5	4
Objectives of the course	1. Students shall learn the techniques of semi micro qualitative analysis of inorganic salt mixtures. 2. Students become familiar with elimination of interfering acid radicals.			
Course Outline	Semimicro inorganic qualitative analysis Analysis of a mixture containing two cations and two anions of which one will be an interfering ion using semimicro methods and conventional scheme with hydrogen sulphide. 1. Cations to be Studied: lead, copper, bismuth, cadmium, antimony, iron, aluminium, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium 2. Anions to be studied: Carbonate, Sulphide, Sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate, and phosphate			
Recommended Text	Reference Books: V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.			
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences			

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	acquire knowledge on the systematic analysis of Mixture of salts.	K2
CO2	identify the cations and anions in the unknown substance.	K3
CO3	identify the cations and anions in the soil and water and to test the quality of water.	K4
CO4	assess the role of common ion effect and solubility product	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III	23U3CHPA1	ALLIED PHYSICS – I	5	3

Nature of the course

Employability Oriented	✓	Relevant to Local need	✓
Entrepreneurship Oriented		Relevant to regional need	✓
Skill development Oriented	✓	Relevant to national need	✓
Addresses Gender Sensitization		Relevant to Global development need	✓
Addresses Environment and Sustainability		Addresses Professional Ethics	
Addresses Human Values			

Course Objectives

The main objectives of this course are:

1. To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

SYLLABUS		
Unit	Content	No. of Hours
I	WAVES, OSCILLATIONS AND ULTRASONICS: simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics.	15
II	PROPERTIES OF MATTER: <i>Elasticity:</i> elastic constants – bending of beam – theory of non- uniform bending – determination of Young’s modulus by non-uniform bending - torsion of a wire – determination of rigidity modulus by torsional pendulum <i>Viscosity:</i> streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille’s formula – comparison of viscosities – burette method, <i>Surface tension:</i> definition – molecular theory – droplets formation–shape, size and lifetime – drop weight method – interfacial surface tension.	15
III	HEAT AND THERMODYNAMICS: Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde’s process of liquefaction of air– thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot’s cycle – efficiency – entropy – change of entropy in reversible and irreversible process.	15

IV	ELECTRICITY AND MAGNETISM: Potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart’s law – field along the axis of the coil carrying current. Peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories.	15
V	DIGITAL ELECTRONICS AND DIGITAL INDIA: logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan’s theorem – verification – overview of Government initiatives: software technological parks under MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India.	15

Text books:

1. R. Murugesan (2001), Allied Physics, S. Chand &Co, New Delhi.
2. Brijlal and N. Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi.
3. Brijlal and N. Subramaniam (1994), Properties of Matter, S. Chand & Co., New Delhi.
4. J.B. Rajam and C.L. Arora (1976). Heat and Thermodynamics (8th edition), S. Chand & Co., New Delhi.
5. R. Murugesan (2005), Optics and Spectroscopy, S. Chand & Co, New Delhi.
6. A. Subramaniyam, Applied Electronics 2ndEdn., National Publishing Co., Chennai.

References:

1. Resnick Halliday and Walker (2018). Fundamentals of Physics (11thedition), John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. V.R. Khanna and R.S. Bedi (1998), Textbook of Sound 1stEdn. Kedharnaath Publish & Co, Meerut.
3. N.S. Khare and S.S. Srivastava (1983), Electricity and Magnetism 10thEdn., Atma Ram & Sons, New Delhi.
4. D.R. Khanna and H.R. Gulati (1979).
5. Optics, S. Chand &Co. Ltd., New Delhi.
6. V.K. Metha (2004). Principles of electronics 6thEdn. S. Chand and company.

Web resources:

1. https://youtu.be/M_5KYncYNyc
2. <https://youtu.be/ljJLJgIvaHY>
3. https://youtu.be/7mGqd9HQ_AU
4. <https://youtu.be/h5jOAw57OXM>
5. <https://learningtechnologyofficial.com/category/fluid-mechanics-lab/>

Pedagogy: Teaching / Learning methods

• Lecture	• Tutorial	• Assignment	• PPT Presentation
• Quiz	• Group Discussion	• e-content Seminar	

Course Outcomes

On completion of this course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically.	K1, K2
CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	K1, K2
CO3	Comprehend basic concepts of thermodynamics and associated theorems able to interpret the process of low temperature physics in the background of growth of this technology.	K1, K2
CO4	Articulate the knowledge about electric current, potential, electric field and correlate the connection between electric field and magnetic field.	K2, K3
CO5	Interpret the real life digital circuits using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Acquire information about various Govt. programmes/ institutions in this field and will have an idea on Digital India.	K2, K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	2	3	1	2
CO2	3	3	3	2	3	1	2
CO3	3	3	3	1	3	1	1
CO4	3	3	3	1	1	1	1
CO5	3	3	3	3	3	1	1

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III & IV	23U4CHPHAPL	ALLIED PHYSICS PRACTICALS (NS)	3	3

Nature of the course

Employability Oriented	✓	Relevant to Local need	✓
Entrepreneurship Oriented		Relevant to regional need	✓
Skill development Oriented	✓	Relevant to national need	✓
Addresses Gender Sensitization		Relevant to Global development need	✓
Addresses Environment and Sustainability		Addresses Professional Ethics	
Addresses Human Values			

Course Objectives

The main objectives of this course are:

1. Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results
2. Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

List of Experiments – Any 14 Experiments

1. Young's modulus by non-uniform bending using pin and microscope
2. Rigidity modulus by static torsion method.
3. Surface tension and interfacial Surface tension – drop weight method
4. Calibration of low range voltmeter using potentiometer
5. Verification of truth tables of basic logic gates using ICs
6. Verification of De Morgan's theorems using logic gate ICs.
7. Use of NAND as universal building block.
8. Radius of curvature of lens by forming Newton's rings
9. Thickness of a wire using air wedge
10. Specific resistance of a wire using PO box
11. Determination of figure of merit table galvanometer
12. Determination of Earth's magnetic field using field along the axis of a coil
13. Characterisation of Zener diode

14. Construction of AND, OR, NOT gates using diodes and transistor
15. NOR gate as a universal building block
16. Wavelength of mercury lines using spectrometer and grating

Course Outcomes

On completion of this course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Do experiments related with properties of matter and waves	K1, K2
CO2	Set up experimentation in analog and digital electronics and to correlate the results	K1, K2
CO3	Understand physics concepts of light, electricity and magnetism and do the experiments	K1, K2

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Specific Outcomes

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	2	3	1	2
CO2	3	3	3	2	3	1	2
CO3	3	3	3	1	3	1	1

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Subject Code	Title Of The Paper	Hours Of Teaching/ Week	No. of Credits
IV	23U4CHT4	வாதுத் தமிழ் - 4	6	3

Nature of the Course

1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது		7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல்	
2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது		8. Relevent To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது	✓
3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது	✓	9. Relevent To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது	
4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல்		10. Relevent To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது	
5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல்	✓	11. Relevent To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது	
6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல்	✓		

Course Objectives

1. சங்க இலக்கியத்தின் சிறப்பையும், நாடகம் என்னும் இலக்கிய வகையின் தன்மையையும் அகத்திணை, புறத்திணை இலக்கணங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
2. தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்பக் கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.
3. சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர்.
4. தமிழின் தொன்மையையும், செம்மொழித் தகுதியையும் அறிந்து கொள்ளுதல்.

Unit	Details	Hours
Unit-I	எட்டுத்தொகை 1 நற்றிணை (10, 14, 16), குறுந்தொகை (16, 17, 19, 20, 25, 29, 38, 440) கலித்தொகை (38, 51), அகநானூறு (15, 33, 55), புறநானூறு (37, 86, 112), பரிபாடல் —55	18 Hrs
Unit-II	எட்டுத்தொகை 2 நெடுநல்வாடை-நக்கீரர்	18 Hrs
Unit-III	நாடகம் - சபாபதி-பம்மல் சம்பந்த முதலியார்	18 Hrs
Unit-IV	1. பாடம் தழுவிய இலக்கிய வரலாறு 2. பயணங்கள் தொடரும் - கேட்டிவி	18 Hrs

Unit-V	1. மொழிபெயர்ப்பு / கலைச்சொற்கள் 2. கொடுக்கப்பட்டுள்ள ஆங்கிலப்பகுதியைத் தமிழில் மொழிபெயர்த்தல் 3. அலுவலகத் கடிதம் - தமிழில் மொழிபெயர்த்தல்	18 Hrs
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CO Number	CO Statement	Cognitive Level
CO1	சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர்.	K1, K2
CO2	தமிழின் தொன்மையையும், செம்மொழித் தகுதியையும் அறிந்து கொள்ளுதல்.	K2
CO3	நாடக இலக்கியம் மூலம் நடிப்பாற்றலையும். கலைத்தன்மையையும், படைப்பாற்றலையும் வளர்த்தல்.	K4
CO4	தமிழிலிருந்து அலுவலகக் கடிதங்களை மொழிபெயர்க்கும் அறிவைப் பெறுவர்.	K3
CO5	மொழியறிவோடு வேலை வாய்ப்பினைப் பெறுதல்.	K4

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ் பார்வை நூல்கள்.
2. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்.
3. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல்
4. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resources

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. [www.tamilvu.org/ library](http://www.tamilvu.org/library)
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennai.library.com <<http://www.chennai.library.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- [tamilebooks downloads. blogspot.com](http://tamilebooks.downloads.blogspot.com)
7. Tamil Books on line- [books.tamil cube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

பொதுத்தமிழ் —4												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	2	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	3	3	2	2	2	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23U4CHE4	PART - II GENERAL ENGLISH	6	3

Learning Objectives		
LO1	To make students realize the importance of resilience	
LO2	To enable them to become good decision makers	
LO3	To enable them to imbibe problem-solving skills	
LO4	To enable them to use tenses appropriately	
LO5	To help the use English effectively at the work place.	
Unit No.	Unit Title & Text	No. of Periods for the Unit
I	GOALSETTING(UNICEF) Life Story From Chinese Cinderella–Adeline Yen Mah Why I Write- George Orwell Short Essay On Personal Mastery–Robin Sharma On the Love of Life – William Hazlitt	20
II	INTEGRITY Short Story The Taxi Driver – K.S. Duggal Kabuliwala -Rabindranath Tagore A Retrieved Reformation –O Henry Extract from a play The Quality of Mercy (Trial Scene from the Merchant of Venice - Shakespeare)	20
III	COPING WITH EMOTIONS Poem Pride – Dahlia Ravikovitch Phenomenal Woman – Maya Angelou Reader’s Theatre The Giant’s Wife A Tall Tale of Irel and–William Carleton The Princess and the God :A Tale of Ancient India	20
IV	Language Competency Sentences Simple Sentences Compound Sentences Complex Sentences Direct and Indirect Speech	15
V	Report Writing Narrative Report Newspaper Report Drafting Speeches Welcome Address Vote of Thanks	15

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Determine their goals	PO1,PO7
CO2	Identify the value of integrity.	PO1,PO2,PO10
CO3	Deal with emotions.	PO4,PO6,PO9
CO4	Frame grammatically correct sentences	PO4,PO5,PO6
CO5	Write cohesive reports.	PO3,PO8

Text Books (Latest Editions)

1	Oxford Practice Grammar, John Eastwood, Oxford University Press
2	Cambridge Grammar of English, Ronald Carter and Michael McCarthy
3.	George Orwell Essays, Penguin Classics

Web Resources

1	http://www.gradesaver.com/George-orwell-essays/study/summary
2	O' Henry. A Retrieved Reformation. https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf
	Maya Angelou. Phenomenal Woman. https://www.poetryfoundation.org/poems/48985/phenomenal-woman
3	TheQuality of Mercy, https://poemanalysis.com
4	https://www.oxfordscholarlyeditions.com/display/10.1093/acrade/9780199235742.book.1/acrade-9780199235742-div1-106-WilliamHazlitt

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3–Strong, 2–Medium, 1–Low

Mapping with Programme Specific Outcomes:

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

3– Strong, 2 –Medium, 1–Low

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23U4CHCIM	Industry Module - GENERAL CHEMISTRY-IV	5	4
Objectives of the course		This course aims to provide a comprehensive knowledge on <ul style="list-style-type: none"> thermodynamic concepts on chemical processes and applied aspects. thermo chemical calculations transition elements with reference to periodic properties and group study of transition metals. the organic chemistry of ethers, aldehydes and ketones the organic chemistry of carboxylic acids 		
Course Outline		<p>UNIT I Thermodynamics I Terminology – Intensive, extensive variables, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics – Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible, irreversible expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities (C_p & C_v); Joule Thomson effect-inversion temperature.</p> <p>Thermochemistry - heats of reactions, standard states; types of heats of reactions and their applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications; determination of bond energy; Measurement of heat of reaction – determination of calorific value of food and fuels</p> <p>Zeroth law of thermodynamics-Absolute Temperature scale.</p>		
		<p>Unit II Thermodynamics II Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature, volume and pressure, entropy and disorder.</p> <p>Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.</p> <p>Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.</p>		

	<p>UNIT III</p> <p>General Characteristics of d-block elements</p> <p>Transition Elements- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups</p>
	<p>UNIT IV</p> <p>Ethers, Thio ethers and Epoxides</p> <p>Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH₄ Thioethers - nomenclature, structure, preparation, properties and uses.</p> <p>Aldehydes and Ketones</p> <p>Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Ponnordorf Verley reduction, reduction with LiAlH₄ and NaBH₄.</p> <p>Addition reactions of unsaturated carbonyl compounds: Michael addition.</p>
	<p>UNIT V</p> <p>Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdiecker reaction. Formic acid-reducing property.</p> <p>Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids.</p> <p>Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schotten- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement.</p> <p>Active methylene compounds: Keto – enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate</p> <p>Halogen substituted acids – nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids</p> <p>Hydroxy acids – nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on α, β and γ hydroxy acids.</p>

Recommended Text	<ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, <i>Principles of Physical Chemistry</i>, Shoban Lal Nagin Chand and Co., thirty three edition, 1992. 2. K. L. Kapoor, <i>A Textbook of Physical chemistry</i>, (volume-2 and 3), Macmillan, India Ltd, third edition, 2009. 3. P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, Sultan Ch and & Sons, twentieth edition, 2006. 4. M. K. Jain, S. C. Sharma, <i>Modern Organic Chemistry</i>, Vishal Publishing, fourth reprint, 2003. 6. S.M. Mukherji, and S.P. Singh, <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., third edition, 1994.
Reference Books	<ol style="list-style-type: none"> 1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, 4thed.; The Macmillan Company: Newyork, 1972. 2. Lee, J. D. <i>Concise Inorganic Chemistry</i>, 4th ed.; ELBS William Heinemann: London, 1991. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26thed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. <i>Physical Chemistry</i>, 10th ed.; Oxford University Press: New York, 2014. 6. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, 4th ed; Addison Wesley Publishing Company: India, 1993.
Website and e-learning source	<p>MOOC components https://nptel.ac.in/courses/112102255 Thermodynamics https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry</p>

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.	K1
CO2	discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement.	K2
CO3	investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.	K3
CO4	discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.	K
CO5	discuss the chemistry and named reactions related to carboxylic acids and their	K4

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23U4CHCP4	PHYSICAL CHEMISTRY PRACTICAL – I	5	4

Objectives of the course	<p>The course aims at providing an understanding of</p> <ul style="list-style-type: none"> the laboratory experiments in order to understand the concepts of physical changes in chemistry the rates of chemical reactions colligative properties and adsorption isotherm
Course Outline	<ol style="list-style-type: none"> Determination of Partition coefficient of iodine between Carbon tetrachloride Determination of rate constant of acid catalyzed hydrolysis of an ester (Methyl acetate or ethyl acetate). Determination of molecular weight by Rast's method using naphthalene, di phenyl, m- di nitro benzene as solvents and benzamide, naphthalene, acetanilide, di phenyl as solutes.; Determination of CST of Phenol Effect of impurity on CST of Phenol Determination of transition temperature of crystal hydrates such as sodium thio sulphate, sodium acetate, strontium chloride, manganese chloride. Phase diagram of Naphthalene – Di phenyl amine system, Naphthalene – Di phenyl , Naphthalene – m –di nitro benzene, Naphthalene – p- nitro toluene. Determination of strength of NaOH solution by Conductometric titrations using standard HCl acid. Determination of strength of KMnO₄ solution by Potentiometric titrations using standard FAS solution. Determination of cell constant

Recommended Text	1. Sindhu, P.S. <i>Practicals in Physical Chemistry</i> , Macmillan India :New Delhi, 2005. 2. Khosla, B. D. Garg, V. C.; Gulati, A.; <i>Senior Practical Physical Chemistry</i> , R. Chand : New Delhi, 2011. 3. Gupta, Renu, <i>Practical Physical Chemistry</i> , 1 st Ed.; New Age International: New Delhi, 2017.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	describe the principles and methodology for the practical work	K2
CO2	explain the procedure, data and methodology for the practical work.	K1
CO3	apply the principles of electrochemistry, kinetics for carrying out the practical work	K4
CO4	demonstrate laboratory skills for safe handling of the equipment and chemicals	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23U4CHPHA2	ALLIED PHYSICS – II	5	3

Nature of the course

Employability Oriented	✓	Relevant to Local need	✓
Entrepreneurship Oriented		Relevant to regional need	✓
Skill development Oriented	✓	Relevant to national need	✓
Addresses Gender Sensitization		Relevant to Global development need	✓
Addresses Environment and Sustainability		Addresses Professional Ethics	
Addresses Human Values			

Course Objectives

The main objectives of this course are:

1. To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

SYLLABUS		
Unit	Content	No. of Hours
I	OPTICS: interference – interference in thin films – colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster’s law – optical activity – application in sugar industries	15
II	ATOMIC PHYSICS: atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli’s exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect – Zeeman effect (elementary ideas only) – photo electric effect – Einstein’s photoelectric equation	15
III	NUCLEAR PHYSICS: nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life – radio isotopes and uses – controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – nuclear fusion – thermonuclear reactions – differences between fission and fusion.	15
IV	INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES: frame of	15

	reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence – introduction on gravitational waves	
V	SEMICONDUCTOR PHYSICS: p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger – introduction to e-vehicles and EV charging stations	15

Text books:

1. R. Murugesan (2005), Allied Physics, S. Chand & Co, New Delhi.
2. K. Thangaraj and D. Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
3. Brijlal and N.Subramanyam (2002), Textbook of Optics, S.Chand &Co ,New Delhi.
4. R. Murugesan (2005), Modern Physics, S.Chand &Co, NewDelhi.
5. A. Subramaniyam Applied Electronics, 2ndEdn., National Publishing Co., Chennai.

References:

1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11thEdn., John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. D.R.KhannaandH.R. Gulati (1979).
3. Optics, S. Chand &Co. Ltd., New Delhi.
4. Thomas L. Floyd (2017), Digital Fundamentals, 11thEdn., Universal Book Stall, NewDelhi.
5. V.K. Metha (2004), Principles of electronics, 6thEdn.,S.Chandand Company, New Delhi.

Web resources:

1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo
2. <https://www.youtube.com/watch?v=JrRrp5F-Qu4>
3. <https://www.validyne.com/blog/leak-test-using-pressure-transducers/>
4. <https://www.atoptics.co.uk/atoptics/blsky.htm>

Pedagogy: Teaching / Learning methods

• Lecture	• Tutorial	• Assignment	• PPT Presentation
• Quiz	• Group Discussion	• e-content Seminar	

Course Outcomes

On completion of this course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	Explain the concepts of interference, diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns	K1, K2
CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance of interpreting improving theoretical models based on observation.	K1, K2
CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on decay rate half-life and mean-life. Interpret nuclear processes like fission and fusion.	K1, K2
CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice versa.	K2, K3
CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices we daily use like USB chargers and EV charging stations.	K2, K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	2	3	1	2
CO2	3	3	3	2	3	1	2
CO3	3	3	3	1	3	1	1
CO4	3	3	3	1	1	1	1
CO5	3	3	3	3	3	1	1

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
III & IV	23U4CHPHAPL	ALLIED PHYSICS PRACTICALS (NS)	3	3

Nature of the course

Employability Oriented	✓	Relevant to Local need	✓
Entrepreneurship Oriented		Relevant to regional need	✓
Skill development Oriented	✓	Relevant to national need	✓
Addresses Gender Sensitization		Relevant to Global development need	✓
Addresses Environment and Sustainability		Addresses Professional Ethics	
Addresses Human Values			

Course Objectives

The main objectives of this course are:

1. Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results
2. Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

List of Experiments – Any 14 Experiments

1. Young's modulus by non-uniform bending using pin and microscope
2. Rigidity modulus by static torsion method.
3. Surface tension and interfacial Surface tension – drop weight method
4. Calibration of low range voltmeter using potentiometer
5. Verification of truth tables of basic logic gates using ICs
6. Verification of De Morgan's theorems using logic gate ICs.
7. Use of NAND as universal building block.
8. Radius of curvature of lens by forming Newton's rings
9. Thickness of a wire using air wedge
10. Specific resistance of a wire using PO box
11. Determination of figure of merit table galvanometer
12. Determination of Earth's magnetic field using field along the axis of a coil

13. Characterisation of Zener diode
14. Construction of AND, OR, NOT gates using diodes and transistor
15. NOR gate as a universal building block
16. Wavelength of mercury lines using spectrometer and grating

Course Outcomes

On completion of this course, students will be able to

CO Number	CO Statement	Cognitive Level
CO1	do experiments related with properties of matter and waves	K1, K2
CO2	do up experimentation in analog and digital electronics and to correlate the results	K1, K2
CO3	Understand physics concepts of light, electricity and magnetism and do the experiments	K1, K2

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

Mapping of Course Outcomes with Programme Specific Outcomes

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	2	3	1	2
CO2	3	3	3	2	3	1	2
CO3	3	3	3	1	3	1	1

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
IV	23U4CHSEC1	Skill Enhancement Course - Digital Literacy in chemistry	2	2
Objectives of the course	The course aims at providing an understanding of <ul style="list-style-type: none"> • chemometric and cheminformatic methods and applications in solving chemical problems. • representation of chemical structures • chemical structure databases. Molecular similarity and structural searching • Molecular modelling • Chemistry related softwares. 			
CourseOutline	<p>Unit-I Introduction Overview of computer, operating system and programming languages. Introduction to chemometric and cheminformatic methods and applications in solving chemical problems.</p> <p>Representation of chemical structures Fragment code, linear notation, SMILES and connection table.</p> <p>Databases in Chemistry Chemical structure databases.Molecular similarity and structural searching.</p> <hr/> <p>Unit-II Molecular modelling Molecular mechanic (force field) and molecular orbital (ab initio and semi-empirical) methods. Applications: Geometry optimization, Energy Calculation and Estimation of physical/chemical properties.</p> <p>Software Training Chemistry related softwares - Structure drawing softwares, molecular modelling softwares, Molecular visualization and docking tools (Avogadro, Chemdraw, Chem-3D, Pymol & Discovery Studio).</p> <p>Pattern Recognition (Self-Study) Supervised and unsupervised methods, Linear discriminant analysis (LDA), K-nearest neighbors (KNN), Principal Components analysis (PCA) and Hierarchical Clustering.</p>			

Reference Books	<ol style="list-style-type: none"> 1. An Introduction to Chemoinformatics by Andrew R. Leach and Valerie J. Gillet. Springer Publisher 2. Applied Chemoinformatics - Achievements and Future Opportunities. Edited by Thomas Engel and Johann Gasteiger. Wiley-VCH publisher. 3. Computer-Aided Drug Design: Methods and Applications, T.J. Perun C.L. Propst Chemoinformatics -. Edited by Thomas Engel and Johann Gasteiger. Wiley-VCH publisher.
Website and e-learning source	<ul style="list-style-type: none"> • https://towardsdatascience.com/introduction-to-cheminformatics-7241de2fe5a8 • https://chem.libretexts.org/Courses/Intercollegiate_Courses/Cheminformatics/01%3A_Introduction/1.01%3A_Introduction • https://chem.libretexts.org/Courses/Intercollegiate_Courses/Cheminformatics/01%3A_Introduction/1.03%3A_Introduction_to_Data_and_Databases • https://towardsdatascience.com/introduction-to-cheminformatics-7241de2fe5a8

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Understanding of chemometric and cheminformatic methods and applications in solving chemical problems.	K2
CO2	Explain the representation of chemical structures	K4
CO3	Describe the chemical structure databases. Molecular similarity and structural searching	K4
CO4	Evaluate the Geometry optimization, Energy Calculation and Estimation of physical/chemical properties	K5
CO5	Demonstrate the skills in Chemistry related softwares.	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO / PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHC4	ORGANIC CHEMISTRY - I	5	5
Objectives of the course		<p>This course aims to provide an understanding of</p> <ul style="list-style-type: none"> • stereoisomerism in chirals and geometric isomerism in olefins, conformations of ethane and butane • preparation and properties of aromatic and aliphatic nitro compounds and amines • preparation of different dyes, food colour and additives • preparation and properties of five membered heterocycles like pyrrole, furan and thiophene • preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline. 		
Course Outline		<p>UNIT I Stereochemistry Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans, syn-anti isomerism, E/Z notations. Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures - molecules with one and two chiral centres, racemisation- methods of racemisation; resolution- methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms – allenes and biphenyls. Conformational analysis of ethane and butane.</p>		
		<p>UNIT II Chemistry of Nitrogen Compounds – I Nitroalkanes Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro - aci nitro tautomerism. Aromatic nitro compounds Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT. Amines: Aliphatic amines Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement. Physical properties, reactions – alkylation, acylation, carbylamine reaction, Mannich reaction, oxidation, basicity of amines.</p>		

	<p>UNIT III Chemistry of Nitrogen Compounds – II</p> <p>Aromatic amines – Nomenclature, preparation – from nitro compounds, Hofmann’s method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation.</p> <p>Distinction between primary, secondary and tertiary amines - aliphatic and aromatic Diazonium compounds Diazomethane, Benzene diazonium chloride - preparations and synthetic applications.</p> <p>Dyes Theory of colour and constitution; classification based on structure and application; preparation – Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green. Industry oriented content</p>
	<p>UNIT IV Heterocyclic compounds</p> <p>Nomenclature and classification. General characteristics - aromatic character and reactivity. Five-membered heterocyclic compounds</p> <p>Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.</p> <p>Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction. electrophilic substitution reactions.</p> <p>Thiophene synthesis - from acetylene; reactions – reduction; oxidation;</p>
	<p>UNIT V Six-membered heterocyclic compounds</p> <p>Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems</p> <p>Quinoline – preparation - Skraup synthesis and Friedlander’s synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction</p> <p>Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.</p>

Recommended Text	<p>1.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2009.</p> <p>2. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009.</p> <p>3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& CompanyPvt. Ltd., Multicolour edition, 2012.</p> <p>4. P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry,Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.</p> <p>5.C.N.Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.</p>
Reference Books	<p>1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia, sixth edition, 2012.</p> <p>2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.</p> <p>3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition,2009.</p> <p>4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006.</p> <p>5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.</p>
Website and e-learning source	<p>1. www.epgpathshala.nic.in</p> <p>2. www.nptel.ac.in</p> <p>3. http://swayam.gov.in</p> <p>4. Virtual Textbook of Organic Chemistry</p>

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.	K1
CO2	explain preparation and properties of aromatic and aliphatic nitro compounds and amines	K2
CO3	explain colour and constitution of dyes and food additives	K3
CO4	discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene	K5
CO5	discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHC5	INORGANIC CHEMISTRY –I	5	5
Objectives of the course	The course aims to provide knowledge on <ul style="list-style-type: none"> • nomenclature, isomerism and theory of coordination compounds, and chelate complexes • crystal field theory, magnetic properties, stability of complexes and Jahn Teller effect • preparation and properties of metal carbonyls • Lanthanoids and actinoids • preparation and properties of inorganic polymers 			
Course Outline	UNIT I Co-ordination Chemistry - I IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory – geometry of co-ordination compounds with co-ordination number 4 & 6. Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis – application of DMG and oxine in gravimetric analysis – estimation of hardness of water using EDTA, metal ion indicators. Role of metal chelates in living systems – haemoglobin and chlorophyll			
	Unit II Co-ordination Chemistry - II Crystal field theory – Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ - Jahn – Teller effect. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.			
	UNIT III Organometallic compounds Metal Carbonyls Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties			
	UNIT IV Inner transition elements (Lanthanoids and Actinoids) General characteristics of f-block elements - Comparative account of lanthanoids			

	and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction- Chemistry of thorium and Uranium- Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.
	UNIT V Inorganic polymers General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphosphonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.
Recommended Text	1. Puri B R, Sharma R, Kalia K C (2011), Principles of Inorganic Chemistry, 31 th Edition, Milestone Publishers & Distributors, Delhi. 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18 th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4 th Edition, ELBS William Heinemann, London. 4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992.
Reference Books	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2 nd ed., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u> , 1st Edition, University Press (India) Private Limited, Hyderabad 3. Sivasankar B, (2013) <u>Inorganic Chemistry</u> , 1st Edition, Pearson, Chennai 4. Alan G. Sharp (1992), <u>Inorganic Chemistry</u> , 3 rd Edition, Addison-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and e-learning source	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain isomerism, Werner's Theory and stability of chelate complexes	K2
CO2	discuss crystal field theory, magnetic properties and spectral properties of complexes.	K1
CO3	explain preparation and properties of metal carbonyls	K4
CO4	give a comparative account of the characteristics of lanthanoids and actinoids	K5
CO5	explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous	K3

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze;

K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHC6	PHYSICAL CHEMISTRY -I	5	5
Objectives of the course	The course aims at providing an overall view of <ul style="list-style-type: none"> Gibbs free energy, Helmholtz free energy, Ellingham's diagram and partial molar properties chemical kinetics and different types of chemical reactions adsorption, homogeneous and heterogeneous catalysis colloids and macromolecules photochemistry, fluorescence and phosphorescence 			
Course Outline	<p>UNIT I Thermodynamics - III</p> <p>Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.</p> <p>Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation.</p>			
	<p>UNIT II Chemical Kinetics Rate of reaction - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws - Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration)</p> <p>– Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry.</p> <p>Effect of temperature on reaction rate – temperature coefficient - concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT. Complex reactions – reversible and parallel reactions (no derivation and only examples) kinetics of consecutive reactions – steady state approximation.</p>			

	<p>UNIT III Adsorption – Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction –Michaelis- Menten and Briggs- Haldene equation – Lineweaver-Burk plot – inhibition – reversible – competitive, noncompetitive and uncompetitive (no derivation of rate equations) Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis</p>
	<p>UNIT IV Colloids and Surface Chemistry Colloids: Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols), Preparation of Sols- Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis, Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels- preparation of Gels, Applications of colloids Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules</p>
	<p>UNIT V Photochemistry Laws of photo chemistry – Lambert – Beer, Grothaus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – ratelaw – Kinetics of H₂-Cl₂, H₂-Br₂ and H₂-I₂ reactions, comparison between thermal and photochemical reactions. Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation – examples Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision</p>
Recommended Text	<ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physicalchemistry, 28th edition 2019, S, Chand & Co. 4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986.
Reference Books	<ol style="list-style-type: none"> 1. J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson, 1st edition, 2013. 2. Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003. 3. P. W. Atkins, and Julio de Paula, Physical Chemistry, OxfordUniversity press, seventh edition, 2002. 4. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition, 2009. 5. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001

Website and e-learning source	1. https://nptel.ac.in 2. https://swayam.gov.in 3. www.epgpathshala.nic.in
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Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellingham's	K1
CO2	apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.	K2
CO3	compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogeneous and heterogeneous catalysis.	K3
CO4	demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules.	K4
CO5	utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.	K5

Cognitive Level: K1 - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO / PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHEL1A	Major Elective – I BIOCHEMISTRY	4	3
Objectives of the course	This course is designed to provide knowledge on <ul style="list-style-type: none"> relationship between biochemistry and medicine, composition of blood structure and properties of amino acids, peptides, enzyme, vitamins and proteins biological functions of proteins, enzymes, vitamins and hormones biochemistry of nucleic acids and lipids metabolism of lipids 			
Course Outline	UNIT I Logic of Living Organisms Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis.			
	UNIT II Peptides and Proteins Amino acids – nomenclature, classification – essential and Non-essential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions. Peptides – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N-terminal analysis – Sanger’s & Edmann method; C terminal analysis - Enzymic method. Proteins – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary. Metabolism of Amino acids – general aspects of metabolism (a brief outline); urea cycle.			
	UNIT III Enzymes and Vitamins Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland’s induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation. Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.			

	<p>UNIT IV Amino acids Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions; RNA – types– structure - functions; biosynthesis of proteins</p> <p>Hormones Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).</p>
	<p>UNIT V Lipids Occurrence, biological significance of fats, classification of lipids. Simple lipids – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance. Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids.</p>
Recommended Text	<ol style="list-style-type: none"> 1. Bahl, B. S.; Bhal, A. <i>Advanced Organic Chemistry</i>, 3rd ed.; S. Chand: New Delhi, 2003. 2. Jain, M.K.; Sharma, S.C. <i>Modern Organic Chemistry</i>, Vishal Publications: New Delhi, 2017. 3. Shanmugam, A. <i>Fundamentals of Biochemistry for Medical Students</i>, 6th ed.; Published by the author, 1999. 4. Veerakumari, L. <i>Biochemistry</i>, 1st ed.; MJP Publications: Chennai, 2004. 5. Jain, J. L.; <i>Fundamentals of Biochemistry</i>, 2nd ed.; S.Chand: New Delhi, 1983.
Reference Books	<ol style="list-style-type: none"> 1. Conn, E. E.; Stumpf, P. K. <i>Outline of Biochemistry</i>, 5th ed.; WileyEastern: New Delhi, 2002. 2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. <i>Text Book of Biochemistry</i>, 4th ed.; Macmillan: New York, 1970. 3. Lehninger, A. L. <i>Principles of Biochemistry</i>, 2nd ed.; CBS Publisher: Delhi, 1993. 4. Rastogi, S. C. <i>Biochemistry</i>, 2nd ed.; Tata McGraw-Hill: New Delhi, 2003 5. . Chatterjea, M. N.; Shinde, R. <i>Textbook of Medical Biochemistry</i>, 5th ed.; Jaypee Brothers: New Delhi, 2002.
Website and e-learning source	<ol style="list-style-type: none"> 1) http://library.med.utah.edu/NetBiochem/nucacids.html 2) http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html 3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry <p>https://onlinecourses.nptel.ac.in/noc19_cy07/preview Experimental Biochemistry</p>

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain molecular logic of living organisms, composition of blood and bloodcoagulation	K2
CO2	explain synthesis and properties of amino acids, determination of structure of peptides and proteins	K1
CO3	explain factors influencing enzyme activity and vitamins as coenzymes	K4
CO4	explain RNA and DNA structure and functions	K5
CO5	explain biological significance of simple and compound lipids	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23UCHEL1B	Major Elective – I ANALYTICAL CHEMISTRY	4	3
Objectives of the course		<ol style="list-style-type: none"> 1. Students learn about the competence in collecting and interpreting data from their knowledge on analytical techniques. 2. Students learn the techniques of gravimetric analysis. 3. Students learn about thermo gravimetric analysis, differential thermal analysis and its applications. 4. Students learn about chromatographic techniques such as TLC, GLC, HPLC and their applications industries, research fields and in day to day life. 		
Course Outline		<p>UNIT - I Error analysis: Types of errors-minimizing errors - significant figures - accuracy - methods of expressing accuracy - precision - methods of expressing precision - mean, median, mode, mean deviation, standard deviation and confidence limits – Q test- correlation co-efficient. Estimations of commercial samples: Determination of percentage purity in washing soda and Bleaching power - estimation of glucose and phenol.</p>		
		<p>UNIT – II Gravimetric analysis: Principle - theories of precipitation - solubility product and precipitation – conditions of precipitations - specific and selective precipitants, organic and inorganic precipitants - purity of precipitates – co precipitation & post precipitation - precipitation from homogeneous solution - use of sequestering agents</p>		
		<p>UNIT – III Chromatography: Adsorption and partition Chromatography principle - Paper chromatography: Principle, development of chromatogram, ascending, descending and radial techniques – Thin layer chromatography: Choice of adsorbent, experimental methods - R_f-values and factors affecting the R_f values – applications of TLC. Superiority of TLC over paper chromatography - Column chromatography: Preparation of the column, elution, recovery of substances and applications.– Gas chromatography: Principles and technique. Ion - exchange chromatography: Principle - requirements of a good resin - experimental techniques - High Pressure Liquid Chromatography (HPLC): Principles and advantages</p>		
		<p>UNIT – IV Thermo analytical methods: Principles of TGA, DTA and DSC - Characteristics of TGA ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and DTA ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$) curves - factors affecting TGA and DTA curves - applications of TGA and DTA. Electro analytical techniques: Theory of electro gravimetric analysis -</p>		

	determination of Copper (by constant current procedure). <i>Electrolytic separation of metals</i> : Principle - separation of copper and nickel, Coulometry : principle - Coulometry at controlled potential - apparatus and technique - separation of nickel and cobalt.
	UNIT – V Colorimetry and spectrophotometry : principle of colorimetric analysis - colorimetric estimation of Ni ⁺² and Fe ⁺³ - spectrophotometric determination of chromium. Separation Purification techniques : principle involved in separation by precipitation and Solvent extraction - principles of crystallization, fractional crystallization - Principles and techniques of sublimation and solvent extraction (soxhlet extraction), simple, fractional and steam distillation, distillation under reduced pressure - <i>Desiccants</i> .
Recommended Text	<ol style="list-style-type: none"> 1. Sharma, B.K. <i>Industrial Chemistry</i>, 9th ed.; Goel Publishing House:Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. <i>Harry's Cosmeticology</i>, 7th ed.; Chemical Publishers : New York, 1982. 3. Alex V. Ramani, <i>Food Chemistry</i>, MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, <i>Applied Chemistry</i>, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. <i>Food Science</i>, 4th ed.; New Age InternationalPublication, 2005.
Reference Books	<ol style="list-style-type: none"> 1. Douglas A. Skoog and Donald M. West, F.J. Holler, <i>Fundamentals of Analytical Chemistry</i>, 7th edition, Harcourt College Publishers. 2. Mendham J., Denney R.C., Barnes J.D., Thomas M., <i>Vogel's Text book of Quantitative Chemical analysis</i>, 6th edition ,Pearson education. 3. Gopalan. R., Subramaniam P.S. and Rengarajan K., <i>Elements of Analytical Chemistry</i>, Sultan Chand and Sons, NewDelhi(2009). 4. Usharani S., <i>Analytical Chemistry</i>, Macmillian India Ltd., NewDelhi(2000) 5. B.K. Sharma, <i>Instrumental methods of Chemical analysis</i>, Himalaya Publ. House, Delhi, 2006. 6. Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis'', Himalaya publishing house.
Website and e-learning source	<ol style="list-style-type: none"> 1. http://www.sciencecases.org/irradiation/irradiation_notes.asp 2. http://discovery.kcpc.usyd.edu.au/9.5.5/ 3. https://www.wipo.int/about-ip/en/ 4. www.nptel.ac.in 5. http://swayam.gov.in

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Students should able to understand about the competence in collecting and interpreting data from their knowledge on analytical techniques.	K1
CO2	Students should able to learn about the techniques of gravimetric analysis..	K2
CO3	Students should able to understand about the thermo gravimetric analysis, differential thermal analysis and its applications.	K4
CO4	Students should understand about chromatographic techniques such as TLC, GLC, HPLC and their applications industries, research fields and in day to day life.	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHEL2A	Major Elective - II PHARMACEUTICAL CHEMISTRY	4	3
Objectives of the course		<ol style="list-style-type: none"> 1. Student learns about the terminology and important drugs and the mode of actions. 2. Student learns about the application of disinfectants and antiseptics. 3. Student learns about the function of analgesic and antipyretics. 4. Student able to aware about the antibiotics. 5. Student gets to know the estimation of sugar and hemoglobin. 		
Course Outline		UNIT-I Terminology: Drugs, Pharmacy, Pharmacology, Pharmacognosy, Toxicology, Chemotherapy, Medicinally important compounds-Aluminium Alum, Aluminium hydroxide gel - Phosphorous –Phosphoric acid, Hypo phosphorus acid-Iron-Ferrous gluconate - Ferrous sulphate-Preparation, Properties ad uses.		
		UNIT-II Analgesic and Antipyretics: Types-Narcotic analgesics –Morphine, Heroin, Pethidine - Structure and Uses. Non-narcotic analgesics-Aspirin, MethylSalicylate, Paracetamol, Phenactin- Preparation, Properties and Uses. Analgin, Indometacin, Sulindac Ibuprofen-Structure and Uses.		
		UNIT-III Antibiotics: Introduction, Pencillin – Types, Structure, Properties, assay, SAR chloroamphenicol, Structure Properties, SAR. Streptomycin– Structure, Properties and Uses.		
		UNIT – IV Blood: Composition of blood, Function of erythrocytes, leucocytes, platelets, Blood grouping and matching, Anticoagulant drugs, Haematological agents. Coagulation or blood clotting, Physiological function of plasma protein, Role of blood as oxygen carrier.		
		UNIT – V Clinical Chemistry: Determination of sugar(glucose) in serum – Folin and WV's method- O-toluidine method – diagnostic test for sugar in urine-Benedict's test, Determination of serum cholesterol- Sacketles method for total cholesterol-detection of cholesterol in urine- detection of anaemia-estimation of haemoglobin(Hb concentration)- red cell count-Principle, Apparatus and Reagents and Procedure.		

Reference Books	<p>Jayashree Ghosh, A Text Book of Pharmaceutical Chemistry; 5th Ed., S.Chand and Company Ltd., New Delhi,2014.</p> <p>2. S.Lakshmi; Pharmaceutical Chemistry; 1st Ed., S.Chand and Company Ltd., New Delhi, 2011.</p> <p>3. Bhagavathi Sundari; Applied Chemistry; 1st Ed., MJP Publishers, Chennai, 2006.</p>
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Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Student should able to learn about the terminology and important drugs and the mode of actions.	K1
CO2	Student should understand about the application of disinfectants and antiseptics.	K2
CO3	Student should identify the function of analgesic and antipyretics.	K4
CO4	Student able to aware about the antibiotics.	K3
CO5	explain Student get to know the estimation of sugar and hemoglobin.	K5

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHEL2B	Major Elective – II FOOD CHEMISTRY	4	3
Objectives of the course	This course aims at giving an overall view of the <ul style="list-style-type: none"> • Types of food • Food adulteration and poisons • Food additives and preservation 			
Course Outline	<p>UNIT I Food Adulteration Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.</p> <p>Unit-II Food Poison Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) -Chemical poisons - First aid for poison consumed victims.</p> <p>UNIT-III Food Additives Food additives -artificial sweeteners – Saccharin - Cyclamate and Aspartate Food flavours -esters, aldehydes and heterocyclic compounds – Food colours – Emulsifying agents – preservatives -leavening agents. Baking powder – yeast – tastemakers – MSG - vinegar.</p> <p>UNIT-IV Beverages Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addictionto alcohol– diseases ofliver andsocial problems.</p> <p>UNIT-V Edible Oils Fats and oils - Sources of oils - production of refined vegetable oils - preservation.Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heartdiseases-determination of iodine value, RM value,saponification values and their significance.</p>			
Recommended Text	<ol style="list-style-type: none"> 1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006. 3. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 4. Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022. 5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Padmini S Ghugre, New age international publishers, second edition, 2021. 			

Reference Books	<ol style="list-style-type: none"> 1. H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4th Edition, 2009. 2. M.Swaminathan, Food Science and Experimental Foods, Ganesh and Company, 1979. 3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and their applications Springer New York 2nd ed. 2008. 4. Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourth revised and extended edition, 2009. 5. Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.
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Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.	K2
CO2	get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin)pesticides, DDT, BHC, Malathion	K1
CO3	get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate andAspartate in the food industries.	K3
CO4	acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beveragesexamples.	K4
CO5	study about fats and oils - Sources of oils - production of refined vegetable oils -preservation. Saturated and unsaturated fats –MUFA and PUFA	K6

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
V	23U5CHNME	Non Major Elective - Cosmetics, perfumes and Pesticides	2	2
Objectives of the course	This course is designed to provide knowledge on <ul style="list-style-type: none"> • Preparation of cosmetics • Preparation and uses of hair dye, shampoo etc. • Essential oils and their importance in cosmetic industries • Benefits and adverse effects of synthetic pesticides • Synthesis and technical manufacture of DDT, malathion, parathion 			
Course Outline	Unit – I Cosmetics and perfumes A general study including preparation and uses of the following: Hair dye, hair spray, Shampoo, Sun-tan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirant and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, e-phenyl ethyl alcohol, Jasmone, civetone, Muscone.			
	Unit – II Pesticides General introducing to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene); Organophosphates (Malathion, Parathion); Carbamates (carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).			
Recommended Text	1. Norrish Shreave. R. and Joseph A. Brink Jr Chemical Process Industries, McGraw Hill, Industrial Book Company London. 2. Brain A.C.S. Reinhold, Production and properties of Industrial chemicals — New York. 3. Burgh, A. Fermentation Industries, Inter science, New York. 4. P. C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Co., New Delhi, 2011.			
Reference Books	1. Sharma B.K., Industrial Chemistry, Goel Publishing House, Meerut, 2003. 2. R. Gopalan, D. Venkappayya, S. Nagarajan, Engineering Chemistry, Vikas Publishing House PVT Ltd., Reprint 2000.			

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Prepare the cosmetics	K2
CO2	Know about the Preparation and uses of hair dye, shampoo etc.	K1
CO3	Describe the Essential oils and their importance in cosmetic industries	K3
CO4	Know the Benefits and adverse effects of synthetic pesticides	K4
CO5	Expertise in Synthesis and technical manufacture of DDT, malathion, parathion	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHC8	ORGANIC CHEMISTRY – II	6	5
Objectives of the course	This course aims to provide an understanding of <ul style="list-style-type: none"> • classification, isolation and discussing the properties of alkaloids and terpenes • preparation and properties of saccharides • biomolecules • different molecular rearrangement. • preparation and properties of organometallic compounds 			
Course Outline	UNIT I Alkaloids Classification, isolation, general properties- Hofmann Exhaustive Methylation; Structure elucidation – Coniine, piperine, nicotine. Terpenes: Classification, Isoprene rule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.			
	UNIT II Carbohydrates Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples. Monosaccharides – configuration – D and L hexoses – aldohexoses and ketohexoses. Glucose, Fructose – Occurrence, preparation, properties, reactions, structural elucidation, uses. Interconversions of sugar series – ascending, descending, aldose to ketose and ketose to aldose. Disaccharides – sucrose, lactose, maltose - preparation, properties and uses (no structural elucidation). Polysaccharides – Source, constituents and biological importance of homopolysaccharides- starch and cellulose, heteropolysaccharides – hyaluronic acid, heparin.			
	UNIT III: Molecular rearrangements: Types of rearrangements (nucleophilic and electrophilic). <i>Mechanism with evidence for the following re-arrangements:</i> pinacol - pinacolone, benzil- benzilic acid, benzidine, Claisen, Fries, Hofmann, Curtius, Lossen, Beckman, dienone – phenol rearrangement			
	UNIT IV Special reagents in organic synthesis LiAlH ₄ , NaBH ₄ , tri- tertiarybutoxyaluminium hydride 9BBN, BINAP/BINOL,			

	BOC, DABCO, DCC, DIBAL-H, DMAP, NBS, SeO ₂ , trimethyl silyl iodide Organometallic compounds in Organic Synthesis Preparation, Properties and applications: Grignard Reagents, Gilman's reagent, Ziegler – Natta, Wilkinson, Zeiss's Salt
	UNIT V Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis.
Recommended Text	<ol style="list-style-type: none"> 1. M.K.Jain, S. C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint, 2009. 2. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rd edition, 2009 3. Arun Bahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand & Company Pvt. Ltd., Multicolour edition, 2012. 4. P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007. 5. C Bandyopadhyaya; An Insight into Green Chemistry; Published on 2020
Reference Books	<ol style="list-style-type: none"> 1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia, 6th edition, 2012. 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, 11th edition, 2012. 3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 7th edition, 2009. 4. I. L. Finar, Organic Chemistry, Vol. (1 & 2), England, Wesley Longman Ltd, 6th edition, 2006. 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.
Website and e-learning source	<ol style="list-style-type: none"> 1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in 4. Virtual Textbook of Organic Chemistry 5. https://vlab.amrita.edu/

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain isolation and properties of alkaloids and terpenes	K1
CO2	explain preparation and reactions of mono and disaccharides	K2
CO3	classify biomolecules and natural products based on their structure, properties, reactions and uses.	K3
CO4	explain molecular rearrangements like benzidine, Hoffmann etc.,	K4
CO5	preparation and properties of organolithium compounds	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHC9	PHYSICAL CHEMISTRY –II	5	5
Objectives of the course	The course aims at providing an overall view of <ul style="list-style-type: none"> • phase diagram of one and two component systems • chemical equilibrium, • separation techniques for binary liquid mixtures. • electrical conductance and transport number. • galvanic cells, EMF and significance of electrochemical series. 			
Course Outline	UNIT-I Phase rule Definition of terms; derivation of phase rule ; application to one component systems – water and sulphur - super cooling, sublimation ; two component systems – solid liquid equilibria- simple eutectic (lead - silver and bismuth - cadmium), freezing mixtures (potassium iodide- water), compound formation with- congruent melting points (magnesium – zinc and ferric chloride – water system), peritectic change (sodium – potassium), solid solution (gold-silver); copper sulphate – water system.			
	UNIT II Chemical equilibrium Law of mass action – thermodynamic derivation – relationship between K_p and K_c – application to the homogeneous equilibria – dissociation of PCl_5 gas, N_2O_4 gas – equilibrium constant and degree of dissociation - formation of HI, NH_3 and SO_3 – heterogeneous equilibrium – decomposition of solid calcium carbonate – Lechatelier principle – van't Hoff reaction isotherm – temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clausius-Clayperon equation – Clausius-Clayperon equation and its applications			
	UNIT III Binary liquid mixtures Ideal liquid mixtures – non ideal solutions – azeotropic mixtures – fractional distillation – partially miscible mixtures – phenol-water, triethylamine-water, nicotine-water – effect of impurities on critical solution temperature; immiscible liquids- steam distillation; Nernst distribution law – applications.			

	<p>UNIT IV Electrical Conductance and Transference Arrhenius theory of electrolytic dissociation – Ostwald’s dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – interionic effects – Debye Huckel theory –Onsager equation (noderivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf’s theoretical device), transport number –determination – Hittorf’s method, moving boundary method – factors affecting transport number – determination of ionic mobility; Kohlrausch’s law- applications; molar ionic conductance and viscosity (Walden’s rule); applications of conductance measurements – determination of - degree of dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of water, solubility and solubility product of sparingly soluble salts - conductometric titrations – acid base titrations.</p>
	<p>UNIT V Galvanic Cells and Applications Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, thermodynamics and EMF – calculation of ΔG, ΔH, and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes – metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series – applications of electrochemical series. Chemical cells with and without transport, concentration cells with and without transport; Applications of EMF measurements applications of EMF measurements – determination of ACTIVITY coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations – acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis; redox indicators - use of diphenylamine indicator in the titration of ferrous iron against dichromate. Industrial component Galvanic cells- lead storage, Ni-Cd, Li and Zn-air, Al-air batteries Fuel cells – H₂-O₂ cell – efficiency of fuel cells. corrosion –mechanism, types and methods of prevention.</p>
Recommended Text	<ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, ShobanLalNagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physicalchemistry, 28th edition 2019, S, Chand & Co. 4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986.
Reference Books	<ol style="list-style-type: none"> 1. K. L. Kapoor, A Textbook of Physical Chemistry, MacmillanIndia Ltd, third edition, 2009. 2. Gilbert. W. Castellen, Physical Chemistry, Narosa PublishingHouse, third edition, 1985.

	<ol style="list-style-type: none"> P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 D.N. Bajpai, Advanced Physical Chemistry, S.Chand & Co., 2001
Website and e-learning source	<ol style="list-style-type: none"> Thermodynamics - NPTEL https://www.youtube.com/watch?v=f0udxGcoztE Introduction to chemical equilibrium – MIT opencourse ware

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and solid solutions.	K1
CO2	apply the concepts of chemical equilibrium in dissociation of PCl_5 , N_2O_4 and formation of HI, NH_3 , SO_3 and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation.	K2
CO3	Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, partially miscible mixtures and immiscible liquids.	K3
CO4	Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance.	K5
CO5	Construct electrochemical cell with the help of electrochemical series and calculate cell EMF. Demonstrate the applications of EMF and significance of potentiometric titrations.	K4

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Lower

Level of Correlation between PSO's and CO's

CO / PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

fSemester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHCP5	Gravimetric and Organic preparation practical	5	5
Objectives of the course		This course is designed to provide knowledge on <ul style="list-style-type: none"> • basic principles of physical chemistry experiments • hands on experience in carrying out the experiments 		
Course Outline		1. Students learn the techniques of gravimetric analysis. 2. Students learn the methods of preparing organic compounds.		
		Gravimetric Estimation: <ol style="list-style-type: none"> 1. Estimation of Barium as Barium chromate 2. Estimation of Barium as sulphate. 3. Lead as chromate. 4. Lead as sulphate. 5. Estimation of Calcium as oxalate mono hydrate 6. Nickel as Di Methyl Glyoxime complex 7. Magnesium as magnesium or oxinate. 8. Copper as cuprous thiocyanate. 9. Estimation of chloride as silver chloride. 		
		A. Organic preparation: <ol style="list-style-type: none"> 1. Oxidation: Benzoic acid from benzaldehyde 2. Hydrolysis: Salicylic acid from salicylaldehyde 3. Nitration : m-Dinitro benzene from nitro benzene 4. Nitration: Picric acid from phenol 5. Bromination: Tri bromo aniline from aniline <ol style="list-style-type: none"> i. Tri bromo phenol from phenol ii. p- Bromo acetanilide from acetanilide 6. Osazone from glucose 		
Recommended Text		1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997)		

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Know the basic principles of physical chemistry experiments	K1
CO2	learn the techniques of gravimetric analysis.	K2
CO3	Students Students learn the methods of preparing organic compounds	K3
CO4	Establish hands on experience in carrying out the experiments	K5
CO5	acquire the knowledge on various organic reactions	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHEL3A	Major Elective - III FUNDAMENTALS OF SPECTROSCOPY	5	3
Objectives of the course	<p>This course is designed to provide knowledge on</p> <ul style="list-style-type: none"> • electrical and magnetic properties of organic and inorganic compounds • basic principles of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry • instrumentation of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry • applications of various spectral techniques in structural elucidation • solving combined spectral problems 			
Course Outline	<p>UNIT I Electrical and Magnetic properties of molecules Dipole moment – polar and nonpolar molecules – polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules. Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism – determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism Microwave spectroscopy Rotation spectra - diatomic molecules (rigid rotator approximation) selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications</p>			
	<p>UNIT II Ultraviolet and Visible spectroscopy Electronic spectra of diatomic molecules (Born Oppenheimer approximation) - vibrational coarse structure – rotational fine structure of electronic vibration transitions – Frank Condon principle – dissociation in electronic transitions – Birge-Sponer method of evaluation of dissociation energy – pre-dissociation transition - σ-σ^*, π-π^*, n-σ^*, n-π^* transitions. Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β - unsaturated ketones. Elementary Problems. Colorimetry - principle and applications (estimation of Fe³⁺)</p>			
	<p>UNIT III Infrared spectroscopy Vibration spectra – diatomic molecules – harmonic oscillator and anharmonic oscillator; Vibration – rotation spectra – diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer approximation oscillator) - selection rules, vibrations of polyatomic molecules – stretching and bending vibrations – applications – determination of force constant, moment of inertia and internuclear distance – isotopic shift – application of IR spectra to simple organic and inorganic molecules – (group frequencies)</p>			

	<p>Raman Spectroscopy Rayleigh scattering and Raman scattering of light – Raman shift – classical theory of Raman effect – quantum theory of Raman effect – Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) – applications.</p>
	<p>UNIT IV Nuclear magnetic resonance spectroscopy: PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems.</p>
	<p>UNIT V Mass spectrometry Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula-fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules. Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).</p>
Recommended Text	<ol style="list-style-type: none"> 1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. <i>Elements of Analytical Chemistry</i>; S Chand: New Delhi, 2003. 2. Usharani, S. <i>Analytical Chemistry</i>, 1sted.; Macmillan: India, 2002. 3. Banwell, C.N.; Mc Cash, E. M. <i>Fundamentals of Molecular Spectroscopy</i>, 4th ed.; Tata McGraw Hill, New Delhi, 2017. 4. U.N.Dash, <i>Analytical Chemistry Theory and Practice</i>, Sultan Chand&Sons, 2nd Ed., 2005 5. B.K.Sharma, <i>Spectroscopy</i>, 22nd ed., Goel Publishing House, 2011.
Reference Books	<ol style="list-style-type: none"> 1. Srivastava, A. K.; Jain, P. C. <i>Chemical Analysis an Instrumental Approach</i>, 3rded.; S.Chand, New Delhi, 1997. 2. Robert D Braun. <i>Introduction to Instrumental Analysis</i>; Mc.Graw Hill: New York, 1987. 3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. <i>Fundamentals of Analytical Chemistry</i>, 9thed.; Harcourt college Publishers: USA, 2013. 4. Madan, R. L.; Tuli, G. D. <i>Physical Chemistry</i>, 2nded.; S.Chand: New Delhi, 2005. 5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. <i>Principles of Physical Chemistry</i>, 43rd ed.; Vishal Publishing: Delhi, 2008.
Website and e-learning source	<ol style="list-style-type: none"> 1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf 2. http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html 3. www.epgpathshala.nic.in 4. www.nptel.ac.in 5. http://swayam.gov.in

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain electrical and magnetic properties of materials and microwave spectroscopy	K1
CO2	explain theory, instrumentation and applications of Infrared and Raman spectroscopy	K2
CO3	apply selection rules to understand spectral transitions, explain Woodward – Fieser’s rule for the calculation of wavelength maximum of conjugated dienes	K3
CO4	explain theory, instrumentation and applications of NMR spectroscopy	K4
CO5	explain theory, instrumentation and applications of Mass spectrometry	K5

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO’s and CO’s

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHEL3B	Major Elective – III NANO SCIENCE	5	3
Objectives of the course	This course aims at providing knowledge on <ul style="list-style-type: none"> • introduction to nanoparticles/clusters and nanocomposites • properties of nanomaterials • characterization of nanomaterials by different methods • synthesis of carbon nanotubes, graphene, quantum dots, self-assembled nanomaterials • applications of nanomaterials as sensors 			
Course Outline	UNIT I Introduction to nanoscience Definition of terms – nanoscience, nanoparticles, clusters, quantum dots, nanostructures and nanocomposites. Electron behaviour in free space, bulk material and nanomaterials. Synthesis and stabilization of nanomaterials Top down approach (physical methods), mechanical dispersion – ball milling, methods based on evaporation of a precursor-inert gas condensation, ion sputtering, spray pyrolysis, aerosol synthesis-nanolithography. Bottom-up approach (chemical methods) - solvothermal synthesis, photochemical method, gamma radiolysis, sonochemical synthesis, electro deposition, sol-gel method, nanomaterials via chemical routes- solvents reducing agents, capping agents-stabilization of nanoparticles -electrostatic and steric stabilization, common stabilizers, nanoparticle growth in solution, templated growth, Langmuir – Blodgett (L-B) method, reverse micelles-emulsion method.			
	Unit II Properties of materials on a nanoscale Optical properties of metal and semiconductor nanomaterials- surface Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), quantum confinement effect, tuning of optical spectrum. Magnetic properties - Fe ₃ O ₄ particle, supra magnetic properties, electronic properties, Chemical properties- chemical process on the surface of nanoparticles, catalysis, mechanical properties.			
	UNIT III Techniques employed for characterisation of nanomaterials Spectroscopy – UV-visible, Photoelectron spectroscopy – Electron microscopy – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning probe microscopy (SPM) – Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Optical microscopy – confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram only].			

	<p>UNIT IV Special nanomaterials Carbon Nano Structures Carbon nanotubes: Introduction - types - zigzag, armchair, helical, synthesis by CVD, Functionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes, Field emission, Fuel Cells, Display devices . Other Important Carbon based materials: Preparation and Characterization Fullerene, Graphene, properties, DLC and nanodiamonds and Applications Semiconductor nanoparticles: Quantum dots, synthesis – chemical synthesis using clusters, properties, porous silicon – electrochemical etching, aerogel – types – silica aerogel, resorcinol formaldehyde (RF) aerogels, zeolites – applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMS) – inorganic, organic molecules.</p> <p>UNIT V Application of nanomaterials Biomedical Applications- drug, drug delivery, biolabelling, artificial implants, cancer treatment. Sensors – Natural nanoscale sensors, chemical sensors, biosensors, electronic noses. Optics & Electronics – Nanomaterials in the next generation computer technology, high definition TV, flat panel displays, quantum dot laser, single electron transistors [SET]. Nanotechnology in agriculture – Fertilizer and pesticides nanomaterials for water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology – human & environmental safety risks.</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. Sulabha K. Kulkarni, <i>Nanotechnology: Principles and Practices</i>, Capital Publishing Co., New Delhi. 2. Pradeep. T, <i>Nano: The Essentials, Understanding Nanoscience and Nanotechnology</i>; Tata McGraw-Hill Publishing Company Limited, NewDelhi, 2007. 3. Shah. M.A.; Tokeer Ahmad, <i>Principles of Nanoscience and Nanotechnology</i>; Narosa Publishing House, New Delhi, 2010. 4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. JamesMurday, <i>Textbook of Nanoscience and Nanotechnology</i>;Universities press, India Ltd ,Hyderabad. 2012.
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Sharma. P.K., <i>Understanding Nanotechnology</i>; Vista International Publishing House, Delhi. 2008. 2. Charles P. Poole Jr.; Frank J. Owens. <i>Introduction to Nanotechnology</i>; A John Wiley & Sons, INC., Publication, 2003. 3. Viswanathan B., <i>Nano Materials</i>;Narosa Publishing House, New Delhi, 2009. 4. Edited by C.N.R. Rao; Mu¨ller.A; Cheetham. A.K.<i>Nanomaterials Chemistry Recent Developments and New Directions</i>, WILEY-VCH Verlag GMBH & Co.,KGaA, Darmstad. 5. Jing Zhong Zhang, <i>Optical properties and spectroscopy of Nanomaterials</i>; World Scientific Publishing Pvt. Ltd., Singapore.
<p>Website and e-learning source</p>	<ol style="list-style-type: none"> 1) http://www.nanotechnology.com/docs/wtd015798.pdf 2) http://nccr.iitm.ac.in/Nanomaterials.pdf

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	explain the general concepts and physical phenomena of relevance within the field of nanoscience.	K2
CO2	describe the properties, synthesis, characteristics of nanomaterials, special nanomaterials and applications.	K1
CO3	examine the structure, properties, applicability and characterization of nanomaterials	K4
CO4	analyze various synthesis procedures, characterizations and uses of carbon nanotubes, fullerene and graphene	K5
CO5	discuss applications of nanomaterials of sensors and in optics and electronics	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHEL4A	Major Elective – IV INORGANIC CHEMISTRY –II	5	3
Objectives of the course	The course aims to provide knowledge on <ul style="list-style-type: none"> • tracer elements and their role in the biological system. • iron transport and storage • metallo enzymes, oxygen transport. • silicates and their applications <ul style="list-style-type: none"> • industrial applications of refractories, alloys, paints and pigments 			
Course Outline	UNIT I Bioinorganic Chemistry Essential and trace elements: Role of Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , Fe ³⁺ , Cu ²⁺ and Zn ²⁺ in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.			
	UNIT II Metal ion transport and storage Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage – copper and zinc.			
	UNIT III Metallo enzymes Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.			
	UNIT IV Silicates Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)			
	UNIT V Industrial Applications of Inorganic Compounds Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits and internship mandatory.			
Recommended Text	1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31 th ed., Milestone Publishers & Distributors, Delhi. 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18 th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4 th ed., ELBS William Heinemann, London. 4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd. 5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992			

Reference Books	<ol style="list-style-type: none"> 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u>, IstEdition, University Press (India) Private Limited, Hyderabad 3. Sivasankar B, (2013) <u>Inorganic Chemistry</u>, Ist Edition, Pearson, Chennai 4. Alan G. Sharp (1992), <u>Inorganic Chemistry</u>, 3rd Edition, Addition-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.
Website and e-learning source	<ol style="list-style-type: none"> 1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	ability to explain the importance of tracer elements on biological system.	K1
CO2	explain the metal ion transport, Bohr effect, Na, K, Ca pump.	K2
CO3	explain the function of Vitamin B ₁₂ , Zn-Cu enzyme, ferredoxin, cluster enzymes.	K3
CO4	classification and structure of silicates.	K4
CO5	explain the manufacture of refractories, explosives, paints and pigments	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHEL4B	Major Elective- IV INDUSTRIAL CHEMISTRY	5	3
Objectives of the course	This course is designed to provide knowledge on <ul style="list-style-type: none"> • classifications and characteristics of fuels • preparation of cosmetics • manufacture of sugar, paper, cement and leather and food processing • applications of abrasives, lubricants and other industrial products • intellectual property rights 			
Course Outline	<p>UNIT I Survey of Indian Industries and mineral resources in India</p> <p>Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal.</p> <p>Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol- knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number.</p> <p>Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses.</p> <p>Natural gas: LPG-composition, advantages, application; gobar gas- production, composition, advantages, application. Propellants – rocket fuels (basic idea)</p>			
	<p>UNIT II Cosmetics</p> <p>Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations.</p> <p>Dental care: tooth pastes – ingredients.</p> <p>Hair care: shampoos-types, ingredients; conditioners-types, ingredients. Perfumes: natural-plant origin-parts of the plant used, chief constituents; animal origin-amber gries, civetone and musk; synthetic-classification- esters-amylsalicylate alcohols-citronellol; terpeneols-geraniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.</p> <p>Soaps and Detergents</p> <p>Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.</p> <p>Detergents-definition, properties-cleansing action; soapless detergents- anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.kinetics of consecutive reactions – steady state approximation.</p>			

	<p>UNIT III Sugar Industry Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar.</p> <p>Food Preservation and processing Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.</p>
	<p>UNIT IV Abrasives Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.</p> <p>Leather Industry Structure and composition of skin, hide; Manufacture of leather – pre- tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing.</p> <p>Paper Industry Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.</p>
	<p>UNIT V Lubricants Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids, selection of lubricants.</p> <p>Cement Industry Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.</p> <p>Intellectual Property Rights Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. Sharma, B.K. <i>Industrial Chemistry</i>, 9th ed.; Goel Publishing House:Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. <i>Harry's Cosmeticology</i>, 7th ed.; Chemical Publishers : New York, 1982. 3. Alex V. Ramani, <i>Food Chemistry</i>, MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, <i>Applied Chemistry</i>, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. <i>Food Science</i>, 4th ed.; New Age International Publication, 2005.

Reference Books	<ol style="list-style-type: none"> 1. Jain, P.C.; Jain, M. <i>Engineering Chemistry</i>, 16th ed.; Dhanapet Rai: Delhi, 1992 2. George Howard, <i>Principles and Practice of Perfumes and Cosmetics</i>, Stanley Therones, Cheltenham: UK, 1987. 3. Thankamma Jacob, <i>Foods, Drugs and Cosmetics - A Consumer Guide</i>, Macmillan : London, 1997. 4. ShankuntalaManay, N.; Shadaksharaswamy, M. <i>Food Facts and Principles</i>, 3rd ed.; New Age Publication, 2008. 5. Neeraj Pandey, KhushdeepDharni, <i>Intellectual Property Rights</i>, PHI Learning, 2014.
Website and e-learning source	<ol style="list-style-type: none"> 1. http://www.sciencecases.org/irradiation/irradiation_notes.asp 2. http://discovery.kcpc.usyd.edu.au//9.5.5/ 3. https://www.wipo.int/about-ip/en/ 4. www.nptel.ac.in 5. http://swayam.gov.in

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	summarize the properties of fuels which include petroleum, water gas, natural gas and propellents	K2
CO2	evaluate cosmetic products, soaps, detergents.	K1
CO3	explain manufacture of sugar, food spoilages and food additives	K4
CO4	explain properties of abrasives, manufacture of leather and paper	K5
CO5	explain properties and manufacture of lubricants and cement, and intellectual property rights	K6

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3

Semester	Course Code	Course Title	Hours of Teaching / Cycle	No. of Credits
VI	23U6CHSEC2	Skill Enhancement Course - Textile chemistry	2	2
Objectives of the course are to	<ul style="list-style-type: none"> • Classify the textile fibers • Learn about colours and its theories • Study Dyeing process • Study Dyeing machineries • Study pretreatments process 			
Course Outline	<p>Unit-I Textile fiber and pretreatment: Classification of textile fibers – concept and techniques of Ginning, Sizing, Desizing, Scouring, Bleaching, and Mercerization - fiber identification tests (Flame test – microscopical & solubility test) Dye chemistry: Colour and sensation - theories of colour and chemical constitution – Witt’s theory - chromospheres - auxochrome – chromogen - classification of dye based on application. Non textile uses of dyes: Leather dyeing, paper dyeing, solvent dyes , food colours, hair colours and fluorescent brightening agents</p> <p>Unit-II Technical terms in dyeing: M.L.ratio – % of shade – % of exhaustion – equilibrium absorption. Dye bath assistants: Explanation and mechanism of exhausting agent, wetting agent, leveling agent, dispersing agent and carrier. Fastness properties – Light, Washing Rubbings and sublimation fastness. Textile proofing – Water proofs, moth proofing, mildew proofing & fire proofing. Dyeing machineries: Padding mangle, Jigger, and Winch. (Note: Chemical structures/chemical equations are not needed in any part)</p>			
Recommended Text	<ol style="list-style-type: none"> 1. Venkataraman. K. The chemistry of synthetic dyes Vol, I, II, III & IV-, Academic Press N.Y., 1949. 2. http://en.wikipedia.org/wiki/Hair_coloring 3. http://www.pbm.com/~lindahl/articles/food_coloring_agents.html. 4. Shenai, V.A., Chemistry of Textile fibres, vol.I, Sevak publication, Mumbai. 			
Reference Books	<ol style="list-style-type: none"> 1. Shenai, V.A. Chemistry of Dyes and Principles of dyeing, vol.II, Sevak publication, Mumbai. 			
Website and e-learning source	<ol style="list-style-type: none"> 1. http://en.wikipedia.org/wiki/Food_coloring 			

Course Outcomes (for Mapping with POs and PSOs)

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

CO Number	CO Statement	Cognitive Level
CO1	Classify the textile fibers	K1
CO2	Learn about colours and its theories	K2
CO3	gain experience on Dyeing process	K3
CO4	expertise pretreatments process	K4
CO5	Study Dyeing machineries	K3

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	S	S	S	S	S	S	S
CO 2	M	S	S	S	M	S	S
CO 3	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	S
CO 5	S	M	S	S	S	S	S

S – Strong

M – Medium

L – Low

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3