2023 - T[1]

RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)

THANJAVUR – 613 005

(Re-Accredited with 'A' Grade by NAAC & Affiliated to Bharathidasan University)

B.Sc., CHEMISTRY - SYLLABUS

M.Sc., CHEMISTRY - SYLLABUS

M.Phil., CHEMISTRY - SYLLABUS

CBCS - LOCF

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TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION

Effective from the Academic Year2023-2024

BOARD OF STUDIES MEETING HELD ON 24.07.2023

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APPROVED BY THE ACADEMIC COUNCIL ON _____

PG & RESEARCH DEPARTMENT OF CHEMISTRY

Rajah Serfoji Government College (Autonomous)
NAAC 'A' Grade & DST-FIST Institution
(Affiliated to Bharathidasan University, Tiruchirapalli)
Thanjavur-613 005, Tamilnadu, India.

Board of Studies in Chemistry

AGENDA

14.07.2023

The meeting of the board of studies in chemistry for B.Sc M.Sc, and M.Phil, Programmes for the Academic Year 2023-2024 will be held on 24.07.2023 at 11.00 am in the Department of Chemistry, Rajah Serfoji Government College (Autonomous), Thanjavur-05.

The following agenda will be discussed in the meeting:

1. To present the Action Taken Report based on the suggestion of the previous board of studies held on 18.08.2022 and the Academic Council held on 06.01.2023.
2. To discuss the feedback from the staff, the students and the parents on the current curriculum and syllabus.
3. To discuss the revision of the course outline of B.Sc and M.Sc chemistry programmes in order to accommodate more courses to enable the students to earn more credits under CAS (Credits Accumulation System).
4. Other academic activities.

14.7.23

CONTROLLER OF EXAMINATIONS
RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)
THANJAVUR - 613 005.

HEAD OF THE DEPARTMENT OF CHEMISTRY
RAJAH SERFOJI GOVT. COLLEGE
THANJAVUR - 613 005.

RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS),
THANJAVUR - 613005
DEPARTMENT OF CHEMISTRY.

BOARD OF STUDIES MEETING - 2023

DATE : 24.07.2023 TIME : 11:00 am

PLACE : CHEMISTRY RAILWAY HALL

The board of studies meeting for Chemistry held on 24.07.2023 at 11.00 am to discuss the agenda. The agenda was presented before the Board of studies discussion.

The meeting was convened by the Head of the department / chair person of the Board of studies, Dr. K. Rajarajan.

Based on the discussion the Board passed the following resolutions for further actions.

Resolutions:

Resolved to approve the

(1). Curriculam structure and the syllabi framed on the premises of Undergraduate of Bharathidasan University for B.Sc., M.Sc., and M.Phil., chemistry for those who joined in the year 2022-2023

(2). Curriculam structure and syllabus for B.Sc - chemistry (Semester III to VI) for those who joined in the year 2022-2023

(3). Curriculam structure and syllabus for M.Sc. chemistry (Semester III and IV) for those who joined in the year 2022-2023.

(4). Curriculam structure and Syllabus for Allied chemistry courses for other Science department UG Programmes for those who join in the year 2022 - 2023.

Curriculam structure and the syllabi framed on the premisius of UGC - CBCS - LOCF Bharathidasan University and TANSCHE for B.Sc., M.Sc., and M.Phil., chemistry Programmes for the academic year 2023 - 2024 onwards.

(5). Resolved to approve the list of Elective which provide the students (2023 - 2024 onwards) a broad spectrum of choices to select and to make up their course of study in B.Sc., and M.Sc., Chemistry programmes.

(6). Resolved to approve the syllabus of the list. Skill based courses for B.Sc chemistry Programme

(7). Resolved to motivate the students to accumulate more credits in their course of study through Credit Accumulation system (CAS) of the CBCS.

(8). Resolved to recommend to the department to offer diploma / certificate programmes, which can be done concurrently by both the UG and PG students which will help them to shape their future career and widen their knowledge.

MEMBERS PRESENT

1. Dr. K. RAJARAJAN — CHAIRMAN
ASSISTANT PROFESSOR & HEAD
RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS)
THANJAVUR - 613005
24/03/23

2. Dr. A. ILANGOVAN — UNIVERSITY NOMINEE
PROFESSOR
DEPARTMENT OF CHEMISTRY
BHARATHIDASAN UNIVERSITY
TRICHY - 24
24.7.23

3. Dr. K. KRISHNASAMY — SUBJECT EXPERT-I
PROFESSOR
DEPARTMENT OF CHEMISTRY
ANNAMALAI UNIVERSITY
CHIDAMBARAM.
24/7/2023

4. Dr. R. THIRUNEELAKANDAN — SUBJECT EXPERT-II
PROFESSOR
DEPARTMENT OF CHEMISTRY
ANNA UNIVERSITY, BIT CAMPUS
TRICHY - 24.
24/07/23

5. Mr. SEKAR GANESAN — INDUSTRIALIST
HEAD - SOUTH INDIA OPERATIONS
BASF INDIA LTD. CHENNAI - 048

6. Dr. M. PUGAZHENTHI — ALUMNUS.
ASSISTAN PROFESSOR
AVVM SRI PUSHPAM COLLEGE (AUTONOMOUS)
POONDI, THANJAVUR.
24/7/23

DEPT. OF CHEMI
RSAC, THANJA

7. Dr. I. KNANASUNDARAM
ASSISTANT PROFESSOR

24/7/23

8. Dr. N. INBARSAN
ASSISTANT PROFESSOR

24/07/23

9. Prof. N. PUNITHA
ASSISTANT PROFESSOR

24/7/23

10. Prof. M. ANITHA
ASSISTANT PROFESSOR

24/7/23

11. Dr. P. SANKEETHA
ASSISTANT PROFESSOR

24/7/23

12. Dr. M. MANKALAM
ASSISTANT PROFESSOR

27/7/2023.

13. Prof. N. VIDHYULATHA
ASSISTANT PROFESSOR

24/7/23

14. Dr. K. VIJAYALAKSHMI
ASSISTAN PROFESSOR

24/7/23

15. Dr. R. CHITHIRAVEL
ASSISTANT PROFESSOR

24/07/23

16. Dr. R. MANIMEKALAI
ASSISTANT PROFESSOR

24/07/2023

MEMBERS
DEPT. OF CHEMISTRY
RSLC, TIRUNELVELI

17. Dr. C. KATHIRAVAN
ASSISTANT PROFESSOR

24/07/23

18. Dr. M. RAVISHANKAR
ASSISTANT PROFESSOR

24/07/23

19. Prof. R. RADHAKRISHNAN
ASSISTANT PROFESSOR

24.07.23

20. Dr. D. ILANGESWARAN
ASSISTANT PROFESSOR

24/07/23

21. Dr. S. SELVAKUMAR
ASSISTANT PROFESSOR

24/07/23

22. Dr. R. BALAJI
ASSISTANT PROFESSOR

24/07/23

23 Prof. A. SIVAKUMAR
ASSISTANT PROFESSOR

24/7/23

24. Dr. T. RAJKUMAR
ASSISTANT PROFESSOR

25. Dr. S. FRANCIS
ASSISTANT PROFESSOR

24/07/23

26. Dr. S. LAWRENCE
ASSISTANT PROFESSOR

24/07/2023

27. Dr. I. ELANGOVAN
ASSISTANT PROFESSOR

24/07/23

28. Dr. M. ELAMARAN
ASSISTANT PROFESSOR

RAJAH SERFOJI GOVERNMENT COLLEGE
(AUTONOMOUS)
THANJAVUR-613005

PG & RESEARCH DEPARTMENT OF CHEMISTRY

CURRICULUM AND SYLLABUS

FOR

B.Sc. Degree Programme in Chemistry

Semester Pattern (THREE-YEAR DEGREE PROGRAMME)

CBCS - LOCF

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TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION

Effective from the Academic Year2023-2024

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc. Chemistry**
Programme Code:	
Duration:	**3 Years (UG)**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work

	efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11: Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12: Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one"s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to: **PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory. **PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively **PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.

	PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models. **PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects. **PSO6: Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.

RAJAH SERFOJI GOVERNMENT COLLEGE (A)
THANJAVUR – 613005
B.Sc., CHEMISTRY COURESE STRUCTURE (From the Academic year 2023-2024 onwards)

Part	Course	Sub-Code	Course Title	Credit	Hours per week (L/T/P)	Exam Hours	Marks		TOTAL
							Int	Ext	
			SEMESTER-I						
I	LT1	T1T1	Language – Tamil	3	6	3	25	75	100
II	LE1	T1E1	English	3	6	3	25	75	100
III	CC1	T1CH1	General Chemistry–I	5	5	3	25	75	100
	CC2	T1CH2P	Quantitative Inorganic estimation (titrimetry)-I	3	3	3	25	75	100
	EC1	T1GMA1/ T1GZO1	Elective- I(Algebra and Differential Calculus /Zoology-I)	3	4	3	25	75	100
	EC2	T2GZO2P/ T2GMA2	Elective- II (Zoology Practical/ Vector Analysis and Analytical Geometry 3D-Theory)	-	2	-	-	-	-
IV	SEC-1	T1CHSE1	Food Chemistry	2	2	3	25	75	100
	FC	CHFC	Fundamental concepts in Chemistry	2	2	3	25	75	100
			Total	**21**	**30**		**175**	**525**	**700**
			SEMESTER-II						
I	LT2	T2T2	Language – Tamil	3	6	3	25	75	100
II	LE2	T2E2	English	3	6	3	25	75	100
III	CC3	T2CH3	General Chemistry–II	5	5	3	25	75	100
	CC4	T2CH4P	Qualitative Organic Analysis-II	3	3	3	25	75	100
	EC2	T2GZO2P/ T2GMA2	Elective- II (Zoology Practical/ Vector Analysis and Analytical Geometry 3D-Theory)	3	2	3	25	75	100
	EC3	T2GMA3/ T2GZO3	Elective –III (Integration and Laplace Transforms/Zoology-II)	4	4	3	25	75	100
IV	SEC-2	T2CHSE2	Role of Chemistry in daily Life (DS)	2	2	3	25	75	100
	SEC-3	T2CHSE3	Cosmetics and Personal care Products (DS)	2	2	3	25	75	100
			Total	**25**	**30**		**200**	**600**	**800**

SEMESTER-III

I	LT3	T3T3	Language – Tamil	3	6	3	25	75	100
II	LE3	T3E3	English	3	6	3	25	75	100
III	CC5	T3CH5	General Chemistry–III	5	5	3	25	75	100
	CC6	T3CH6P	Qualitative Inorganic Analysis-III	3	3	3	25	75	100
	EC4	T3GPH1	Elective-IV (Integrated Physics-I)	3	3	3	25	75	100
	EC5	T4GPH2P	Elective- V (Integrated Physics)	-	3	-	-	-	-
IV	SEC-4	T3CHSE4	Entrepreneurial skills in Chemistry (DS)	1	1	3	25	75	100
	SEC-5	T3CHSE5	Pesticide Chemistry (DS)	2	2	3	25	75	100
	EVS	T4ES	EVS	-	1	-	-	-	-
			Total	**20**	**30**		**175**	**525**	**700**

SEMESTER-IV

I	LT4	T4T4	Language – Tamil	3	6	3	25	75	100
II	LE4	T4E4	English	3	6	3	25	75	100
III	CC7	T4CH7	General Chemistry–IV	4	4	3	25	75	100
	CC8	T4CH8P	Gravimetric Analysis Practical-IV	3	3	3	25	75	100
	EC5	T4GPH2P	Elective-V (Integrated Physics Practical)	4	3	3	25	75	100
	EC6	T4GPH3	Elective-VI (Integrated Physics-II)	3	3	3	25	75	100
IV	SEC-6	T4CHSE6	Instrumental methods of Chemical Analysis (DS)	2	2	3	25	75	100
	SEC-7	T4CHSE7	Forensic Science (DS)	2	2	3	25	75	100
	EVS	T4ES	EVS	2	1	3	25	75	100
			Total	**26**	**30**		**225**	**675**	**900**

SEMESTER-V									
III	CC9	T5CH9	Organic Chemistry-I	4	6	3	25	75	100
	CC10	T5CH10	Inorganic Chemistry-I	4	6	3	25	75	100
	CC11	T5CH11	Physical Chemistry-I	4	5	3	25	75	100
	CC12	T5CH12P	Physical Chemistry Practical-V	3	3	3	25	75	100
	EC7	T5CHECD	Elective- VII (Biochemistry)	3	4	3	25	75	100
	EC8	T5CHECJ	Elective– VIII (Industrial Chemistry)	3	4	3	25	75	100
IV	VE	T5VE	Value Education	2	2	2	25	75	100
			Internship/Industrial Visit/Field Visit (Carried out in II-Year Summer vacation) (30hours)	2	-	-	-	-	-
			Total	**25**	**30**		**175**	**525**	**700**

SEMESTER-VI									
III	CC13	T6CH13	Organic Chemistry-II	5	6	3	25	75	100
	CC14	T6CH14	Inorganic Chemistry-II	5	6	3	25	75	100
	CC15	T6CH15P	Organic and Inorganic Preparation-Practical-VI	4	4	3	25	75	100
	EC9	T6CHECK	Elective– IX (Physical Chemistry)	3	6	3	25	75	100
	EC10	T6CHECL	Elective– X (Fundamentals of Spectroscopy)	3	6	3	25	75	100
IV	PCS	T6CHPC	Professional Competency Skill	2	2	2	25	75	100
V			Extension Activity	1	-	-	-	-	-
			Total	**23**	**30**		**150**	**450**	**600**
				140					**4400**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	11	15	11	14	21	20	92
Part IV	4	4	3	6	4	2	23
Part V	-	-	-	-	-	1	1
Total	21	25	20	26	25	23	**140**

*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.

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall(K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/Comprehend(K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze(K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate	
	Between various ideas, Map knowledge	
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with prosandcons	
Create(K6)	Check knowledge in specific or off be at situations, Discussion, Debating or Presentations	

PART-A
GENERIC ELECTIVE COURSES
(Offered to Other departments-Maths,Zoology,Bio Chemistry & Physics)

1. General Chemistry-I
2. General Chemistry-Practical
3. General Chemistry-II
4. Chemistry-I
5. Chemistry- Practical
6. Chemistry-II
7. Diary Chemistry
8. Cosmetics and personal Grooming
9. Roll of Chemistry in Daily Life
10. Food Chemistry

PART-B
DISCIPLINE SPECIFIC ELECTIVE COURSES

1. Polymer Science - (TCHECA)
2. Nano Science-(TCHECB)
3. Forensic chemistry-(TCHECC)
4. Bio chemistry-(TCHECD)
5. Pharmaceutical chemistry-(TCHECE)
6. Polymer chemistry-(TCHECF)
7. Agricultural chemistry-(TCHECG)
8. Chemistry in everyday life-(TCHECH)
9. Soil science-(TCHECI)
10. Industrial chemistry-(TCHECJ)
11. Physical Chemistry-(TCHECK)
12. Fundamentals of Spectroscopy-(TCHECL)

GENERIC ELECTIVE COURSES
(Offered From Maths,Zoology & Physics Departments)

MATHEMATICS:
1. Algebra and Differential Calculus
2. Vector Analysis and Analytical Geometry 3D
3. Integration and Laplace Transforms

PHYSICS:
4. Integrated Physics-I
5. Integrated Physics Practical
6. Integrated Physics –II

ZOOLOGY:
7. Zoology-I
8. Zoology-II
9. Zoology Practical
10. Herbal medicine
11. Bio Composting
12. Food Technology

Title of the Course	GENERAL CHEMISTRY-I						
Paper No.	CC1						
Category	Core	Year	I	Credits	5	CourseCode	T1CH1
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	1	-			5	
Prerequisites	Higher secondary chemistry						
Objectives of the course	The course aims at giving an overall view of the • various atomic models and atomicstructure • wave particle duality of matter • periodic table, periodicity in properties and its application in explaining the chemical behavior • nature of chemical bonding, and • fundamental concepts of organic chemistry						
Course Outline	**UNIT I** **Atomic structure and Periodic trends** 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.						
	Unit II **Introduction to Quantum mechanics** Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, significance of Ψ and Ψ^2. **Modern PeriodicTable** **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						

	UNIT-III: Structure and bonding – I **Ionic bond** 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. **Covalent bond** Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB2, AB3, AB4, AB5, AB6 and AB7 Partial ionic character of covalent bond-dipole moment, application to molecules of the type A2, AB, AB2, AB3, AB4; percentage ionic character- numerical problems based on calculation of percentage ioniccharacter.
	UNIT-IV: Structure and bonding - II VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O_2^-, O^{2-}, O2 N2, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors.
	UNIT-V: **Basic concepts in Organic Chemistry and Electronic effects** Types of bond cleavage – heterolytic and hemolytic: arrow pushing in organic reactions:reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, and carbenes. 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 methyl group, dipole moment of aldehydes and nitromethane Types of organic reactions- addition, substitution, elimination and rearrangements
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* 2nded.; S. Chand and Company: New Delhi,2003. 2. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000. 3. Puri,B.R.and Sharma,L.R.*Principles of PhysicalChemistry,* 38thed.; Vishal Publishing Company: Jalandhar, 2002. 4. Bruce, P. Y. and Prasad K. J. R. *Essential Organic Chemistry*, Pearson Education: New Delhi,2008. 5. Dash UN, Dharmarha OP, Soni P.L. Textbook ofPhysical Chemistry, Sultan Chand & Sons: New Delhi,2016
Reference Books	1. Maron, S. H. and Prutton C. P. *Principles of PhysicalChemistry,*4thed.; The Macmillan Company: Newyork,1972. 2. Lee, J. D. *Concise Inorganic Chemistry,* 4th ed.; ELBS William Heinemann:London,1991. 3. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26thed.; Goel Publishing House: Meerut,2001. 4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford University Press: New York,2014. 5. Huheey, J.E.*Inorganic Chemistry: Principles of Structure and Reactivity,* 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/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.

CO2: classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.

CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx, Δp electronegativity, percentage ionic character and bond order.

CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects

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.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO'

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<table>
<tr><td>Title of the Course</td><td colspan="7">Quantitative Inorganic Estimation (titrimetry)-I</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC2</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td>CourseCode</td><td>T1CH2</td></tr>
<tr><td>Semester</td><td>I</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>-</td><td colspan="2">3</td><td colspan="2">3</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at providing knowledge on
• laboratory safety
• handling glass wares
• Quantitative estimation
• preparation of inorganic compounds</td></tr>
<tr><td>Course Outline</td><td colspan="7">Unit I
Chemical Laboratory Safety in Academic Institutions
Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.
Common Apparatus Used in Quantitative Estimation (Volumetric)
Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.
Principle of Quantitative Estimation (Volumetric)
Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.
Unit II
Quantitative Estimation(Volumetric)
Preparation of standard solution, dilution from stock solution
Permanganometry
Estimation of sodium oxalate using standard ferrous ammonium sulphate</td></tr>
</table>

	Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator) **Iodometry** Estimation of copper in copper sulphate using standard dichromate **Argentimetry** Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)
	Unit III **Complexometry** Estimation of hardness of water using EDTA **Estimations** Estimation of iron in iron tablets Estimation of ascorbic acid.
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	**Reference Books:** 1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic Principles of Practical Chemistry,* 2nd ed.; Sultan Chand &Sons: New Delhi,1997. 2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.;*An advanced course in Practical Chemistry,* 3rd ed.; New Central Book Agency: Kolkata, 2007.
Reference Books	1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed.; Pearson Education Ltd: New Delhi,2000.
Website and e-learning source	**Web References:** 1)http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis 2)https://chemdictionary.org/titration-indicator/

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be ableto

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.
CO2: compare the methodologies of different titrimetric analysis.
CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.
CO4: assess the yield of different inorganic preparations and identify the end point of various titrations.

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

CO-PO Mapping (Course Articulation Matrix)

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO'

Signature of the HoD

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Title of the Course	**FOOD CHEMISTRY**						
Paper No.	**SEC –I**						
Category	**NME**	**Year**	I	**Credits**	2	**CourseCode**	T1CHSE1
		Semester	I				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	2	-	-			2	
Prerequisites	Higher secondary Chemistry						
Objectives of the course	This course aims at giving an overall view of the • Types offood • Food adulteration and poisons • Food additives and preservation						
Course Outline	**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.						
	Unit-II **Food Poison** Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) -Chemical poisons - First aid for poison consumed victims.						
	UNIT-III **Food Additives** Food additives -artificial sweeteners – Saccharin - Cyclomate and Aspartate – Food colours– Emulsifying agents – preservatives -leavening agents. Baking powder –Yeast – tastemakers – MSG - vinegar.						
	UNIT-IV **Beverages** Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addiction to alcohol– diseases of liver and social.problems.						
	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 heart diseases-definition of iodine value, RM value,saponification values and their significance.						

Recommended Text	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 publishning house, 2010. 4. Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing,2022. 5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Pdmini S Ghugre, New age international publishers, second edition,2021.
Reference Books	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.de Man, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.
Website and e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.

CO 2: get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion

CO 3: get an exposure on food additives, artificial sweeteners, Saccharin, Cyclomate and Aspartate in the food industries.

CO 4: acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.

CO 5: study about fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats –MUFA and PUFA

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">FUNDAMENTALCONCEPTS IN CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">Foundation Course (FC)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">FC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td>Course Code</td><td>CHFC</td></tr>
<tr><td>Semester</td><td>I</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td>-</td><td colspan="3">-</td><td colspan="2">2</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Higher secondary chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at providing an overall view of the
• importance of Fundamental concept of Nomenclature and fundamental concentration units in chemistry
• understand the four quantum numbers that describe an electron in an atom.
• Knowledge to derive the molecular formula and empirical formula.</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="7">Unit-I
Quantum numbers and shapes of orbitals:
Quantum Numbers- Principal quantum number (n), Azimuthal Quantum number (l), Magnetic Quantum number (m) and Spin Quantum number (s)-Shapes of orbitals-s,p,d and f orbitals.</td></tr>
<tr><td colspan="7">Unit-II
Coordination Ccompounds:
Introduction-basic terminology of coordination compounds-coordination entity, central metal atom, ligand, oxidation number of central metal atom, coordination number and coordination sphere. Werner's theory of coordination compounds. IUPAC naming of coordination compounds-cationic,anionic and neutral complexes.</td></tr>
<tr><td colspan="7">Unit-III
Nomenclature of Organic Compounds
IUPAC system of nomenclature of organic compounds- Alkanes,-straight chain, branch chain hydrocarbons- longest chain rule, lowest number rule, arrangements of prefixes, lowest number for functional groups, names of compounds containing more than one functional group –writing the IUPAC names of alkene, alkynes, alchhols and ketones for the given structural formula and vice versa .</td></tr>
</table>

	Unit-IV **Expression of Concentration Units:** Molarity, Molality, Normality and Molefraction– relation between molarity and normality-relation between molarity and mole fraction-relation between molality and mole fraction-Problems based on preparation of standard solution.
	Unit-V:Determining molecular Formula and Empirical Formula Percentage Composition-calculation of Percentage Composition-Empirical formula- calculation of Empirical formula from percentage composition .Derivation of Molecular Formula-problems.
Recommended Text Reference Books	1.Modern Inorganic Chemistry, R.D.Madan, S.Chand & Company Ltd. Reprint 2016 2.TextBookofOrganicChemistry,P.L.SoniandH.M.Chawla,SultanChand&Sons,29th edition, Reprint2014. 3. Principles of Physical Chemistry, B.R.Puri, L.R.Sharma, Madan S.Pathania,VishalPublishingCompany,Jalandha 44thedition2009

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: describe the location of an electron in an associated atom.
CO2: understand theories of coordination compound and IUPAC Nomenclature
CO3: acquire information about the IUPAC nomenclature of organic compounds.
CO4: discuss about the varies concentration terms in chemistry
CO5: have an idea about the molecular formula and empirical formula

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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T2CH3

Title of the Course	**GENERAL CHEMISTRY-II**						
Paper No.	**CC3**						
Category	**Core**	**Year**	I	**Credits**	5	**Course Code**	**T2CH4P**
		Semester	II				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	4	1	-		5		
Prerequisites	General Chemistry - II						
Objectives of the course	This course aims at providing an overall view of the • chemistry of acids, bases and ionic equilibrium • properties of s and p-block elements • chemistry of hydro carbons • applications of acids and bases • compounds of main block elements andhydro carbons						
Course Outline	**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-Hassel balch 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.						
	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, Na_2CO_3, KBr, $KClO_3$alkaline earth metals. **Chemistry of p- Block Elements (Group 13 & 14)** Preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses.						

UNIT-III

Chemistry of p- Block Elements (Group 15-18)

General characteristics of elements of Group 15:chemistry of H_2N-NH_2, NH_2OH, $NH_3$and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, $P_2O_5$and oxy acids of phosphorous (H_3PO_3 and H_3PO_4).

General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides – oxides of sulphur and selenium Oxyacids of sulphur (Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, $BrF_5$and IF_7), pseudo halogens [$(CN)_2$and $(SCN)_2$] and basic nature of Iodine.

Noble gases: Position in the periodic table. Preparation, properties and Structure of XeF_2, XeF_4, $XeF_6$and $XeOF_4$; uses of noble gases - clathrate compounds.

UNIT-IV

Hydrocarbon Chemistry-I

Petrol products: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

Alkenes-Nomenclature, general methods of preparation – Mechanism of - 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 and polymerization.

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) and vulcanization,

Alkynes

Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.

	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.
	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. **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. Anthracene – synthesis by Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.
	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Madan RD,Sathya Prakash,(2003), Modern Inorganic Chemistry, 2nd ed, 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	1. Maron S Hand Prutton CP,(1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, New york. 2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi. 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., 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	https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding **MOOC components** http://nptel.ac.in/courses/104101090/ Lecture 1: Classification of elements and periodic properties http://nptel.ac.in/courses/104101090/

Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

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

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">QUALITATIVE ORGANIC ANALYSIS-II</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC4</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td>CourseCode</td><td>T2CH4P</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="2"></td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>-</td><td>-</td><td colspan="3">3</td><td>3</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry II</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at providing knowledge on
• Laboratory safety
• handling glass wares
• analysis of organic compounds
• preparation of organic compounds</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT I
Safety rules, symbols and first-aid in chemistry laboratory
Basic ideas about Bunsen burner, its operation and parts of the flame.
Chemistry laboratory glassware –basis information and uses</td></tr>
<tr><td colspan="7">Unit II
Qualitative Organic Analysis
Preliminary examination, detection of special elements - nitrogen, sulphur and halogens
Aromatic and aliphatic nature, Test for saturation and un saturation, identification of functional groups using solubility tests
Confirmation of functional groups
• mono carboxylic acid, di carboxylic acid
• mono hydric phenol, polyhydric phenol
• aldehyde, ketone, ester
• carbohydrate (reducing and non-reducing sugars)
• primary, secondary, tertiary amine
• mono amide, diamide, thioamide
• anilide, nitro compound
• Preparation of derivatives for functional groups</td></tr>
</table>

Reference Books	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principles of Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi,2012. 2. Manna, A.K. *Practical Organic Chemistry*, Books and Allied: India, 2018. 3. Gurtu, J. N; Kapoor, R. *Advanced Experimental Chemistry (Organic)*, Sultan Chand: New Delhi,1987. 4. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel's TextbookofPracticalOrganicChemistry*,5thed.;Pearson:India,1989.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non- reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

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

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Signature of the HoD

Title of the Course	ROLE OF CHEMISTRY IN DAILY LIFE						
Paper No.	SEC-2						
Category	NME	Year	I	Credits	2	Course Code	T2CHSE2
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims at providing an overall view of the • importance of Chemistry in everyday life • chemistry of building materials and food • chemistry of Drugs and pharmaceuticals						
Course Outline	**UNIT-I** General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water.						
	Unit-II Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, polyesters, melamine-formaldehyde resins -preparation and uses only.						
	UNIT-III Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance).						
	UNIT-IV Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.						
	UNIT-V Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.						

Recommended Text	1.Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing,2012. 3. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006. 4. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group,2019. 5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co.Publishers, second edition,2006.
Reference Books	1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourthedition,1977. 2. W.A.Poucher, Joseph A.Brink,Jr.Perfumes, Cosmetics and Soaps, Springer, 2000. 3. A.K.De, Environmental Chemistry,New AgeInternational Public Co., 1990.
Website and e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about the chemicals used in everyday life as well as air pollution and water pollution.

CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,

CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also haveanawarenessaboutCosmeticsToothpastes,facepowder,soapsanddetergents.

CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses

CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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Title of the Course	COSMETICS AND PERSONAL CARE PRODUCTS						
Paper No.	SEC-3 (Discipline Specific)						
Category	SEC	Year	I	Credits	2	Course Code	T2CHSEC3
		Semester	I/ II				
Instructional hours per week	Lecture	Tutorial	Lab Practice	Total			
	2	-	-	2			
Prerequisites	Higher secondary Chemistry						
Objectives of the course	This course aims at familiarizing the students with • formulations of various types of cosmetics and their significance • hair, skin and dental care • makeup preparations and personal grooming						
Course Outline	**Unit I** **Skin care** Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.						
	Unit II **Hair care** Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types –ingredients **Dental care** Tooth pastes – ingredients – mouth wash						
	Unit III **Make up** Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge						
	Unit IV **Perfumes** Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, muskfrommuskdeer;synthetic–classificationemphasizingcharacteristics– esters – alcohols – aldehydes – ketones						
	Unit V **Beauty treatments** Facials - types – advantages – disadvantages; face masks – types; bleach - types–advantages–disadvantages; shaping the brows; eye lashtinting; perming – types ;hair colouring and dyeing ;permanent waving–hairs traightening; wax – types – waxing; pedicure, manicure - advantages –disadvantages						
Recommended Text	1. Thankamma Jacob, (1997) Foods, drugs and come tics – A consumer guide, Macmillan publication, London.						

Reference Books	1. Wilkinson J B E and Moore R J, (1997) Harry's cosmeticology, 7th ed., Chemical Publishers,London. 2. George Howard, (1987) Principles and practiceof perfumes and cosmetics,
	Stanley Therones, Chettenham
Website and e-learning source	1. http://www.khake.com/page75.html 2. Net.foxsm/list/284

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

- **CO1:** know about the composition of various cosmetic products
- **CO2** understand chemical aspects and applications of hair care and dental care and skin care products.
- **CO3**understandchemicalaspectsandapplicationsofperfumesandskincareproducts.
- **CO4**tounderstandthemethodsofbeautytreatmentstheiradvantagesanddisadvantage
- **CO5** understand the hazards of cosmetic products.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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<table>
<tr><td>Title of the Course</td><td colspan="7">GENERAL CHEMISTRY -III</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC5</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td>Course Code</td><td>T3CH5</td></tr>
<tr><td>Semester</td><td>III</td><td colspan="3"></td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry – I and II</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims to provide a comprehensive knowledge on
• 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.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I
Gaseous state
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.

Real gases: Deviations from ideal gas behavior, (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.</td></tr>
<tr><td></td><td colspan="7">Unit-II
Liquid and Solid State
Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.
Crystals –size and shape; laws of crystallography; symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices;</td></tr>
</table>

	classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation 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 Defects in solids - stoichiometric and non stoichiometric defects. **Liquid crystals** – classification and applications.
	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 t1/2 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
	UNIT-IV **Halogen derivatives** **Aliphatic halogen derivatives** Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – SN1, SN2 and SNi 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 tetra acetate.

	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.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. B.R. Puri, L.R. Sharma, M.S. Pathania; *Principles of Physical Chemistry*, 46th edition, Vishal Publishing, 2020. 2. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, Milestone Publishers and Distributors, New Delhi,thirtiethedition,2009. 3. 4. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & amp; Sons, twentieth edition,2006. 4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing, fourth reprint,2003. 5. S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition,1994.
Reference Books	1. T. W. Graham Solomons, *Organic Chemistry*, John Wiley & Sons, fifth edition,1992. 2. A. Carey Francis, *Organic Chemistry*, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, seventh edition,2009. 3. I. L. Finar, *Organic Chemistry*, Wesley Longman Ltd, England,sixth edition, 1996.

	4. P. L. Soni, and H. M.Chawla - *Text Book of Organic Chemistry*, New Delhi, Sultan Chand & Sons, twenty ninth edition,2007. 5. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, fifth edition, 2005.
Website and e-learning source	**MOOC components** https://nptel.ac.in/courses/104104101S olid state chemistry https://nptel.ac.in/courses/103106071 Nuclear industries and safety https://nptel.ac.in/courses/104106119s Introduction to organic chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the kinetic properties of gases by using mathematical concepts.
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.
CO3: investigate the radioactivity, nuclear energy and it's production, also the nuclear waste management.
CO4: write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.
CO5: investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

<table>
<tr><td>Title of the Course</td><td colspan="7">QUALITATIVE INORGANIC ANALYSIS - III</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC6</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td>Course Code</td><td>T3CH6P</td></tr>
<tr><td>Semester</td><td>III</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>1</td><td>-</td><td colspan="2">2</td><td colspan="2">3</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To develop the skill on systematic analysis of simple inorganic salts and mixture of salts.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Semi - Micro Qualitative Analysis
1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide.
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite.
3. Elimination of interfering acid radicals and Identifying the group of basic radicals
4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium
5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="7">Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</td></tr>
<tr><td>Recommended Text</td><td colspan="7">Reference Books:
V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.</td></tr>
<tr><td>Website and e-learning source</td><td colspan="7">https://www.vlab.co.in/broad-area-chemical-sciences</td></tr>
</table>

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO 1: acquire knowledge on the systematic analysis of Mixture of salts.

CO 2: identify the cations and anions in the unknown substance.

CO 3: identify the cations and anions in the soil and water and to test the quality of water.

CO4: assess the role of common ion effect and solubility product

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

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO'

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<table>
<tr><td>Title of the Course</td><td colspan="7">ENTREPRENEURIAL SKILLS IN CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">SEC 4</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC Course</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">1</td><td>Course Code</td><td>T3CHSE4</td></tr>
<tr><td>Semester</td><td>III</td><td colspan="3"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td>1</td><td>-</td><td colspan="3"></td><td>1</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">The course aims at providing training to
• develop entrepreneur skills in students
• to provide hands on experience to prepare and develop products
• develop startups</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT -I

Food Chemistry
Food adulteration-contamination of food items with clay stones, water and toxic chemicals -Common adulterants.
Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect),food colourants, Preservatives, leavening agents, Baking powder and baking soda, yeast, MSG, vinegar.

Dyes
Classification – Natural, synthetic dyes and their characteristics – basic methods and principles of dyeing.

UNIT II

Hands on Experience (Students can choose any four)

Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques.
Preparation of Jam, squash and Jelly, Gulkand, cottage cheese.

Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powde rand disinfectants in small scale.

Extraction of oils from spices and flowers.

Testing of water samples using testing kit.
Dyeing – cotton fabrics with natural and synthetic dyes
Printing – tie and dye, batik.</td></tr>
</table>

Skills acquired from this course	**Entrepreneurial skills.**
Recommended Text	1. GeorgeS & Muralidharan V.(2007)Fibreto Finished Fabric–A Simple Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy GP,AHandbookonPrintingandDyeingofTextiles.
Reference Books	Shyam Jha, Rapid detection of food adulterants andcontaminants (Theory and Practice),Elsevier, e Book ISBN 9087128004289, 1st Edition,2015
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: identify adulterated food items by doing simple chemical tests.

CO 2: prepare cleaning products and become entrepreneurs

CO 3: educate others about adulteration and motivate them to become entrepreneurs.

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

CO-PO Mapping (Course Articulation Matrix)

CO /PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
Weightage	6	6	6	6	6
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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Title of the Course	PESTICIDE CHEMISTRY						
Paper No.	SEC -5						
Category	SEC	Year	II	Credits	2	Course Code	T3CHSE5
		Semester	III				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	Fundamentals in chemistry						
Objectives of the course	This course aims to providing the students • knowledgeaboutthevarioustypesofpesticidesandtheirtoxicity. • to understand the accumulation of pesticides in in the form of residues and itsanalysis. • knowledge on choice of alternate and eco-friendlypesticides.						
Course Outline	**Unit I** **Introduction**: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties. **Toxicity of pesticides**: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides. **Insecticides:** Classification and study of following insecticides with respect to structure, chemical name, physical properties, chemical properties, synthesis, degradation, metabolism, formulations, Mode of action, uses,toxicity.						
	Unit II **Pesticides residues:** Introduction- application of agrochemicals, dissemination pathways of pesticides, causes of pesticide residues, remedies. Pesticides residues in atmosphere- entry into atmosphere, action of pesticides, effects on environments. Pesticides residues inwater- entry into water systems, action and effect in aquatic environment. Pesticides residues in soil. entry into soil, absorption, retention and transport in soil, effects on microorganism, soil condition and fertility, decomposition and degradation by climatic factors and microorganism. **Pesticide Residues effect :** Effects of pesticides residue on human life, birds and animals- routes for exposure to pesticides, action of pesticides on living system.						

	Unit III **Biopesticides:** Pheromones, attractants, repellents – Introduction, types and application (8- Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure, Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate, Icaridin). Baits- Metaldehyde, Iron (II)phosphate, Indoxacarb, Zinc Phosphide, Bromadiolone.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. HandaSK.Principlesofpesticidechemistry.Agrobios(India);2012. 2. Matolcsy G, Nádasy M, Andriska V. Pesticide chemistry. Elsevier; 1989. 3. J. Miyamoto and P. C. Kearney Pesticide Chemistry Human Welfare and the Environment vol. IV Pesticide Residue and Formulation Chemistry, Pergamonpress,1985. 4. R. Cremlyn: Pesticides, JohnWiley.
Reference Books	1. Roy N. K., Chemistry of Pesticides. CBS Publisher & Distributors P Ltd; 1st Ed.(2010). 2. Nollet L.M., Rathore H.S., Handbook of pesticides: methods of pesticide residues analysis. CRC press;2016. 3. Ellerbrock R.H., Pesticide Residues: Significance, Management and Analysis,2005
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to **CO 1:** teach about the pesticides and their toxicity with respect to structure and category. **CO 2:** explain the preparation and property of pesticides **CO 3:** investigate the pesticide residues, prevention and care **CO 4:** demonstrate the extraction and analytical methods of pesticideresidues **CO 5:** make awareness to the public on bio-pesticides	

CO /PSO	PSO 1	PSO 2	PSO 3	PSO4	PS O5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">GENERAL CHEMISTRY-IV</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC7</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Cours Code</td><td rowspan="2">T4CH7</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>4</td><td>-</td><td colspan="2">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry IV</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims to provide a comprehensive knowledge on
• thermodynamic concepts on chemical processes and applied aspects.
• thermo chemicalcalculations
• transition elements with reference to periodic properties and group study of transitionmetals.
• the organic chemistry of ethers, aldehydes andketones
• the organic chemistry of carboxylicacids</td></tr>
<tr><td>Course Outline</td><td colspan="7">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), relation between heat capacities (Cp & Cv); Joule Thomson effect- inversiontemperature.
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.Zeroth law of thermodynamics-Absolute Temperature scale.
.
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.</td></tr>
</table>

	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.. Third law of thermodynamics - Nernst heat theorem; Applications of third law.
	UNIT III **General Characteristics of d-block elements** **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 Zincgroups
	UNIT IV **Ethers, Thio ethers and Epoxides** Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxygroup. Reactions of epoxides with alcohols, ammonia derivatives and LiAH4 Thioethers - nomenclature, structure, preparation, properties and uses.
	Aldehydes and Ketones Nomenclatue, 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 – Pondorf Verley reduction, reduction with LiAlH4 and NaBH4. Addition reactions of unsaturated carbonyl compounds: Michael addition.

	UNIT V **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, Hunsdieckerreaction.Formic acid-reducing property. Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids. **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. Schottan- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtiusrearrangement.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. B.R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Shoban Lal Nagin Chand and Co., thirty three edition,1992. 2. K. L. Kapoor, *A Textbook of Physical chemistry*, (volume-2 and3), Macmillan, India Ltd, third edition, 2009. 3. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & Sons, twentieth edition,2006. 4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing, fourth reprint,2003. 5. S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in Organic Chemistry*, Macmillan India Ltd., third edition,1994.

Reference Books	1. Maron,S.H.andPruttonC.P.*PrinciplesofPhysicalChemistry,* 4th ed.; The Macmillan Company: Newyork,1972. 2. Lee, J. D. *Concise Inorganic Chemistry,* 4th ed.; ELBS William Heinemann:London,1991. 3. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26th ed.; Goel Publishing House: Meerut,2001. 4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford University Press:New York,2014. 5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity,* 4th ed; Addison Wesley Publishing Company:India,1993.
Website and e-learning source	**MOOC components** https://nptel.ac.in/courses/112102255Thermodynamics https://nptel.ac.in/courses/104101136Advanced transition metal chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.

CO2: discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement.

CO3: investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.

CO4: discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.

CO5: discuss the chemistry and named reactions related to carboxylic acids and their derivatives; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.

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

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Signature of the HoD

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Title of the Course	Gravimetric Analysis – IV						
Paper No.	CC8						
Category	Core	Year	II	Credits	3	Course Code	T4CH8P
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
		-	3			3	
Prerequisites							

Course Objectives

- To impart knowledge on Quantitative analysis especially Gravimetric Analysis
- To gain the depth knowledge in Determination of melting and boiling points of simple organic compounds

Course Outcomes

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

- Prepare organic compounds of gravimetric analysis
- To determine the melting point and boiling point of simple organic compounds

I. Gravimetric Analysis

1.Estimation of calcium as calcium oxalate

2.Estimation of barium as barium sulphate

3.Estimation of barium as barium chromate

4.Estimation of lead as lead sulphate

5.Estimation of lead as lead chromate

6.Estimation of nickel as nickel dimethylglyoxime complex

7.Estimation of Mg as oxinate.

II. Determination of melting and boiling points of simple organic compounds.

(Without H_2SO_4 medium)

Websiteand e-learningsource	https://www.vlab.co.in/broad-area-chemical-sciences

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Oncompletionofthecoursethestudentsshouldbeableto

CO1:describetheprinciplesand methodology forthepracticalwork

CO2:explaintheprocedure,dataandmethodologyforthepracticalwork.

CO3:applytheprinciplesof gravimetric analysis forcarryingoutthepracticalwork.

CO4:demonstratelaboratoryskillsforsafehandling of the equipmentandchemicals

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

CO-PO Mapping (Course Articulation Matrix)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weightedpercentageof CourseContributiontoPos	3.0	3.0	3.0	3.0	3.0

LevelofCorrelationbetweenPSO'sandCO's

Signature of the HoD

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Title of the Course	INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS						
Paper No.	SEC – 6						
Category	SEC	Year	II	Credits	2	Course Code	T4CHSE6
		Semester	IV				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2	-	-			2	
Prerequisites	General Chemistry						
Objectives of the course	The course aims at providing an overall view of the • operation and troubleshooting of chemicalinstruments • fundamentals of analytical techniques and its application in the characterization ofcompounds • theory of chromatographic separationand • theory of thermo / electro analyticaltechniques • stoichiometry and the related concentrationterms						
Course Outline	**UNIT-I** **Qualitative and Quantitative Aspects of Analysis** S.I Units, Distinction between Mass and Weight. Moles, Millimoles, Milli equivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Sampling, evaluation of analytical data, Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation, Coefficient of Variation, Confidence Limits, Q- test, F-test, T-test. The Least Square Method for Deriving Calibration plots.						
	UNIT II **Atomic Absorption Spectroscopy**: Basic principles of instrumentation -choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from watersamples.						

	UNIT III **UV-Visible and IR Spectroscopy** Origin of spectra, interaction of radiation with matter, fundamental laws of spetroscopy and selection rules, validity of Beer-Lambert'slaw. **UV-Visible Spectrometry:** Basic principles, instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. **Infrared Spectroscopy:** Basic principles of instrumentation (choice of source, monochromator& detector) for single and double beam instrument; sampling techniques.
	UNIT IV **Thermal and Electro-analytical Methods of Analysis** TGA and DTA- Principle, Instrumentation, methods of obtaining Thermograms, factors affecting TGA/DTA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate **Electroanalytical methods:** polarography - principle, instrumentation and applications. Derivative polarography- Cyclic Voltammetry - principle.
	UNIT V **Separation and purification techniques** Classification, principle, Factors affecting - Solvent Extraction – Liquid - Liquid Extraction, Chromatography: Column, TLC and Paper, Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and Rfvalue.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society ofLongman. 2. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi,2007 3. Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint(2017). 4. R. Speyer, Thermal Analysis of Materials, CRC Press,1993. 5. R.A. Day and A.L. Underwood, Quantitative Analysis, 6thedn., Prentice Hall of India Private Ltd., New Delhi,1993
Reference Books	1. D. A. Skoog, D. M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5thedn., Saunders college publishing, Philadelphia,1998. 2. Dash U N, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi,2011. 3. Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York,2004. 4. Mikes, O. &Chalmes, R.A. Laboratory Handbook of Chromatographic&AlliedMethods,EllesHarwoodLtd.London 5. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, sixth edition Pearson Education,2000
Website and e-learning sources	1. http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf 2. http://eric.ed.gov/?id=EJ386287 3. http://www.sjsu.edu/faculty/watkins/diamag.htm 4. http://www.britannica.com/EBchecked/topic/108875/separation-and-purification 5. http://www.chemistry.co.nz/stoichiometry.htm

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and Atomic Absorption spectrometry

CO2: explain theory, instrumentation and application of UV visible and Infrared spectroscopy.

CO3: able to discuss instrumentation, theory and applications of thermal and electrochemical techniques

CO4: explain the use of chromatographic techniques in the separation and identification of mixtures

CO5: explain preparation of solutions, stoichiometric calculations

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

CO-PO Mapping (Course Articulation Matrix)

CO /PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">FORENSIC SCIENCE</td></tr>
<tr><td>Paper No.</td><td colspan="7">SEC- 7 (Discipline Specific)</td></tr>
<tr><td>Category</td><td>Skill Enhancement Course</td><td>Year
Semester</td><td>II
IV</td><td>Credits</td><td>2</td><td>Course Code</td><td>T4CHSE7</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>2</td><td>-</td><td colspan="2">-</td><td colspan="2">2</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at giving an overall view of
• crime detection through analyticalinstruments
• forgery and itsdetection
• medical aspectsinvolved</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNITI

Poisons
Poisons - types and classification - diagnosis of poisons in the living and the dead -clinical symptoms - postmortem appearances. Heavy metal contamination (Hg, Pb, Cd) of seafoods - use of neutron activation analysis in detecting arsenic in human hair. Treatment in cases of poisoning – use of antidotes for commonpoisons.</td></tr>
<tr><td></td><td colspan="7">Unit-II

Crime Detection
Accidental explosion during manufacture of matches and fireworks (as in Sivakasi). Human bombs - possible explosives (gelatin sticks and RDX) - metal detector devices andother security measures for VVIP-composition of bullets and detecting powderburns.</td></tr>
<tr><td></td><td colspan="7">UNIT-III

Forgery and Counterfeiting
Documents - different types of forged signatures - simulated and traced forgeries -inherent signs of forgery methods - writing deliberately modified- uses of ultraviolet rays -comparison of type written letters – checking silver line water mark in currency notes – alloy analysis using AAS to detect counterfeit coins – detection of gold purity in 22 carat ornaments – detecting gold plated jewels -authenticity of diamond.</td></tr>
<tr><td></td><td colspan="7">UNIT-IV

Tracks and Traces
Tracks and traces - small tracks and police dogs - foot prints - costing of</td></tr>
</table>

	foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture - tool marks - paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - detecting steroid consumption in athletes and racehorses.
	UNIT-V **Medical Aspects** Aids - causes and prevention - misuse of scheduled drugs - burns and their treatment by plastic surgery. Metabolite analysis using mass spectrum - Gas chromatography-Arson -natural fires and arson - burning characteristics and chemistry of combustible materials -nature of combustion. Ballistics - classification - internal and terminal ballistics - small arms -laboratory examination of barrel washing and detection of powder residue by chemical tests.
Recommended Text	1. SA Iqbal, M Liviu, Textbook of forensic chemistry, Discovery publishing house private limited,2011. 2. Kelly M. Elkins, Introduction to Forensic Chemistry, CRC Press, Taylor & Francis Group,2019. 3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., Basic principlesofForensicchemistry,HumanaPress,firstedition,2012. 4. Bapuly AK, (2006) Forensic Science – Its application in crime investigation, Paras Medical Publisher,Hyderabad. 5. SharmaB.R.,(2006)ScientificCriminalInvestigation,UniversalLaw Publishing Co. Pvt. Ltd, New Delhi.
Reference Books	1. Richard Saferst in and Criminalistics-An Introduction to Forensic Science (College Version), Sopfestein, Printice hall, eighth edition,2003 2. Suzanne Bell, Forensic Chemistry, Pearson, second international edition,2014. 3. Jay Siegel, Forensic chemistry: Fundamentals and applications, Wiley- Blackwell, first edition,2015. 4. Max M. Houck & Jay A. Segal, (2006) Fundamentals of Forensic Science, Elsevier Academicpress. 5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, (2006) Henry Lee's Crime Scene Book Elsevier Academicpress.

Website and e-learning source	1. http://www.library.ucsb.edu/ist/03-spring/internet.html 2. http://www.wonder howto.com/topic/forensic-science/

Course Learning Outcomes (for Mapping with POs and PSOs)

on completion of the course the students should be able to

CO 1: learn about the Poisons - types and classification of poisons in the living and the dead organisms and also get information about Postmortem.

CO 2: get awareness on Human bombs, possible explosives (gelatin sticks and RDX) and metal defector devices and other security measures for VVIP - composition of bullets and detecting powder burns

CO 3: detect the forgery documents, different types of forged signatures

CO4: have an idea about how to tracks and trace using police dogs, foot prints identification and gain the knowledge in analyzing biological substances - blood, semen, saliva, urineandhair-DNA Fingerprinting for tissue identification in dismembered bodies

CO 5: get the awareness on Aids - causes and prevention and also have an exposure on handling fire explodes.

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

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="8">ORGANIC CHEMISTRY - I</td></tr>
<tr><td>Paper No. CC9</td><td colspan="8">CC9</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">T5CH9</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="4">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="2">-</td><td colspan="4">6</td></tr>
<tr><td>Prerequisites</td><td colspan="8">General Chemistry I,II, III and IV</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">This course aims to provide an understanding of
• 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.</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="8">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.</td></tr>
<tr><td colspan="8">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, physicalproperties; reactions - reduction of nitrobenzene in</td></tr>
</table>

different medium,Electrophilic substitution reactions and 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 and basicity of amines.

UNIT III

Chemistry of Nitrogen Compounds – II

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.

Distinction between primary, secondary and tertiary amines - aliphaticand aromatic.

Diazonium compounds-Diazomethane, Benzene diazonium chloride - preparations and synthetic applications.

Dyes- Theory of colour and constitution; classification based on structure and application; preparation –Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green.

UNIT IV

Heterocyclic compounds

Nomenclature and classification. General characteristics - aromatic character and reactivity.

Five-membered heterocyclic compounds

Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.

Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.

Thiophene synthesis - from acetylene; reactions –reduction; oxidation; electrophilic substitution reactions.

	UNIT V **Six-membered heterocyclic compounds** Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses. **Condensed ring systems** Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.
Extended Professional Component (is a part of internal to be includedin the external examination question paper)component only, Not	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2009. 2.S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009. 3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& CompanyPvt. Ltd., Multicolour edition, 2012. 4.P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007. 5.C.N.Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.
Reference Books	1.R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia, sixth edition, 2012. 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.

	3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition,2009. 4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006. 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.
Website and e-learning sources	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http:/swayam.gov.in 4. Virtual Textbook of Organic Chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to

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

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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THANJAVUR - 613 005

Title of the Course	INORGANIC CHEMISTRY -I						
Paper No.	CC 10						
Category	Core	Year	III	Credits	4	Course Code	T5CH10
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	-	-			6	
Prerequisites	General Chemistry I , II, III and IV						
Objectives of thecourse	The course aims to provide knowledge on • 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 ofhardness of water using EDTA, metal ion indicators.						
	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 $[Ti(H_2O)_6]^{3+}$. 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 polymethyl hydrosol oxane) phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.
Extended Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31thEdition, Milestone Publishers & Distributors, Delhi. 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009),

	Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th 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. 5. 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, 2nd ed ., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited,Hyderabad 3. Sivasankar B, (2013) Inorganic Chemistry.Ist Edition, Pearson, Chennai 4. Alan G. Sharp (1992), Inorganic Chemistry, 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	1.www.epgpathshala.nic.in 2. www.nptel.ac.in 3.http:/swayam.gov.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain isomerism, Werner's Theory and stability of chelate complexes

CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.

CO3: explain preparation and properties of metal carbonyls

CO4: give a comparative account of the characteristics of lanthanoids and actinoids

CO5: explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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Title of the Course	PHYSICAL CHEMISTRY -I						
Paper No.	CC 11						
Category	Core	Year	III	Credits	4	Course Code	T5CH11
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	1	-			5	
Prerequisites	General Chemistry I,II,III and IV						
Objectives of the course	The course aims at providing an overall view of • 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	**UNIT I** **Thermodynamics - III** 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. Partial molar properties – chemical potential, Gibbs Duhem equation, Gibbs- Duhem-Margules equation.						
	UNIT II **Chemical Kinetics** Rate of reaction - 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) - Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry. 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. significance of entropy and free energy of activation. Comparison of collision theory and ARRT. Kinetics of consecutive reactions – steady state approximation						

	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, heterogeneous catalysis. Enzyme catalysis.
	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
	UNIT V **Photochemistry** Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – rate law – Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2 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.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	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 physical chemistry, 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	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, Oxford University 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
Course Learning Outcomes (for Mapping with POs and PSOs) **On completion of the course the students should be able to** **CO1:** explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellinghams **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. **CO3:** compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis. **CO4:** demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules. **CO5:** utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.	

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">PHYSICAL CHEMISTRY
PRACTICAL – I</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC 12</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">T5CH12P</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>-</td><td colspan="3">3</td><td colspan="2">3</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Physical Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">The course aims at providing an understanding of
• the laboratory experiments in order to understand the concepts of physical changes inchemistry
• the rates of chemicalreactions
• colligative properties and adsorption isotherm</td></tr>
<tr><td>Course Outline</td><td colspan="7">I. Distribution law:
a. Partition coefficient of lodine between carbon tetrachl and water
b. Equilibrium constant of the reactions.
$I_2 + I^- \rightarrow I^{3-}$
II Kinetics:
Acid catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate)
III.Molecular weight:
Rast's method : Naphthalene, m-dinitrobenzene and diphenyl as solvents.
IV. Heterogeneous equilibrium:
a. Critical solution temperature of phenol-water system- effect of impurity on C.S.T. (2% NaCl or 2 % succinic acid solutions).
b. Simple eutectic system: Naphthalene – Biphenyl, Napthalene Diphernylamine.
c. Determination of transition temperature: Sodium acetate..H2O, $Na_2S_2O_3.5H_2O$, $SrCl_2.6H_2O$ & $MnCl_2.4H_2O$.
V.Electrochemistry:
Conductivity:
Cell constant
Equivalent conductivity
Conductometric titrations
Potentiometry
Potentiometric titrations.</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="7">Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</td></tr>
</table>

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

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: describe the principles and methodology for the practical work

CO2: explain the procedure, data and methodology for the practical work.

CO3: apply the principles of electrochemistry, kinetics for carrying out the practical work.

CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

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

CO-PO Mapping (Course Articulation Matrix)

CO /PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

Signature of the HoD

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THANJAVUR - 613 005

Title of the Course	BIOCHEMISTRY						
Paper No.	EC7						
Category	Elective	Year	III	Credits	4	Course Code	T5CHECD
		Semester	V				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4		-			4	
Prerequisites	Bio Chemistry						
Objectives of the course	The course aims at providing knowledge on • relationship between biochemistry and medicine, composition ofblood • 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** – classification – essential and Non-essential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions. Urea cycle. **Peptides** – peptide bond – 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.						
	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 Vitamins as coenzymes – functions of TPP, lipoic acid, NAD,NADP, FMN, FAD, pyridoxalphosphate,CoA,folicacid, biotin, cyanocobalamin .						

	UNIT IV **Nucleic 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 **Hormones** Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).
	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.
Extended Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitiveexaminations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Bahl, B. S.; Bhal, A. *Advanced Organic Chemistry*, 3rd ed.; S. Chand: New Delhi, 2003 2. Jain, M.K.; Sharma, S.C. *Modern Organic Chemistry*, Vishal Publications: New Delhi, 2017. 3. Shanmugam, A. *Fundamentals of Biochemistry for Medical Students*, 6th ed.; Published by the author, 1999. 4. Veerakumari, L. *Biochemistry*, 1st ed.; MJP Publications: Chennai,2004. 5. Jain, J. L.; *Fundamentals of Biochemistry*, 2nd ed.; S.Chand: New Delhi, 1983.

Reference Books	1. Conn, E. E.; Stumpf, P. K. *Outline of Biochemistry*, 5th ed.; Wiley Eastern: New Delhi, 2002. 2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. *Text Bookof Biochemistry*, 4th ed.; Macmillan: New York, 1970. 3. Lehninger, A. L. *Principles of Biochemistry*, 2nd ed.; CBS Publisher: Delhi, 1993. Rastogi, S. C. *Biochemistry*, 2nd ed.; Tata McGraw-Hill: New Delhi, 2003. 4. Chatterjea, M. N.; Shinde, R. *Textbook of Medical Biochemistry*, 5thed.; Jaypee Brothers: New Delhi, 2002.
Website and e-learning source	1) http://library.med.utah.edu/NetBiochem/nucacids.html 2) http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKine tics. html 3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry 4).https://onlinecourses.nptel.ac.in/noc19_cy07/preview Experimental Biochemistry

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain molecular logic of living organisms, composition of blood and bloodcoagulation

CO2: explain synthesis and properties of amino acids, determination of structure of peptides and proteins

CO3: explain factors influencing enzyme activity and vitamins as coenzymes

CO4: explain RNA and DNA structure and functions

CO5: explain biological significance of simple and compound lipids

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

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	1	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">INDUSTRIAL CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">EC8</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">T5CHECJ</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>-</td><td colspan="2">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I,II, III and IV</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course is designed to provide knowledge on
• classifications and characteristics of fuels
• preparation of cosmetics
• manufacture of sugar, paper, cement and leather and foodprocessing
• applications of abrasives, lubricants and other industrial products
• intellectual property rights</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I
Survey of Indian Industries and mineral resources in India
Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal.
Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol-knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number.
Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carburetted water gas - preparations - uses.
Natural gas: LPG-composition, advantages, application; gobar gas-production, composition, advantages, application. Propellants – rocket fuels (basic idea)

UNIT II
Cosmetics
Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations.
Dental care: tooth pastes – ingredients.
Hair care: shampoos-types, ingredients; conditioners-types, ingredients.
Perfumes: natural-plant origin-parts of the plant used, chief constituents;</td></tr>
</table>

	animal origin-amber gries, civetone and musk; synthetic-classification-esters-amylsalicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin. **Soaps and Detergents** Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients. 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.
	UNIT III **Sugar Industry** Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar. **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.
	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. **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. **Paper Industry** Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.
	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. **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. **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
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Sharma, B.K. *Industrial Chemistry*, 9th ed.; Goel Publishing House: Meerut, 1998. 2. Wilkinson, J.B.E. Moore, R.J. *Harry's Cosmeticology*, 7th ed.; Chemical Publishers : New York, 1982. 3. Alex V. Ramani, *Food Chemistry,* MJP publishers: Chennai, 2009. 4. Jayashree Ghosh, *Applied Chemsitry*, S. Chand : New Delhi, 2006. 5. Srilakshmi, B. *Food Science*, 4th ed.; New Age International Publication, 2005.
Reference Books	1. Jain, P.C.; Jain, M. *Engineering Chemistry*, 16th ed.; Dhanapet Rai: Delhi, 1992 2. George Howard, *Principles and Practice of Perfumes and Cosmetics*, Stanley Therones, Cheltenham: UK, 1987. 3. Thankamma Jacob, *Foods, Drugs and Cosmetics - A Consumer Guide*, Macmillan : London, 1997. 4. ShankuntalaManay, N.; Shadaksharaswamy, M. *Food Facts and Principles*, 3rd ed.; New Age Publication, 2008. 5. Neeraj Pandey, KhushdeepDharni, *Intellectual Property Rights*, PHI Learning, 2014.

Website and e-learning source	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 Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: summarize the properties of fuels which include petroleum, water gas, natural gas and propellents.
CO2: evaluate cosmetic products, soaps, detergents.
CO3: explain manufacture of sugar, food spoilages and food additives
CO4: explain properties of abrasives, manufacture of leather and paper
CO5: explain properties and manufacture of lubricants and cement, and intellectual property rights

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">ORGANIC CHEMISTRY - II</td></tr>
<tr><td>Paper No.</td><td colspan="7">CC13</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td>Course Code</td><td>T6CH13</td></tr>
<tr><td>Semester</td><td>VI</td><td colspan="2"></td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>5</td><td>1</td><td colspan="3">-</td><td>6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Organic Chemistry – I</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at providing knowledge on
• 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</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">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.</td></tr>
<tr><td colspan="7">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 andketohexoses.
Glucose, Fructose – Occurrence, preparation, properties, reactions, structural elucidation, uses.
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.</td></tr>
</table>

	UNIT III **Molecular rearrangements:** Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt, Pinacole pinacolone and Beckmann rearrangement.
	UNIT IV **Organometallic compounds in Organic Synthesis** Principle, preparations, properties and applications of Group I and II metal organic compounds Li, Hg and Zn compounds. Transition metals, Ni, Fe, Cu, and Cr compounds. Preparation, Properties and applications of Grignard Reagents, Organo Lithium Compounds, Ziegler– Natta, Wilkinson, Metal Carbonyl, 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.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	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 OrganicChemistry, Macmillan IndiaLtd., 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 Bandyopadhya; An Insight into Green Chemistry; Published on 2020

Reference Books	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, 5thEdition, 2010.
Website and e-learning source	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 Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain isolation and properties of alkaloids and terpenes
CO2: explain preparation and reactions of mono and disachharides
CO3: classify biomolecules and natural products based on their structure, properties, reactions and uses.
CO4: explain molecular rearrangements like benzidine, Hoffmann etc.,
CO5: preparation and properties of organolithium compounds

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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THANJAVUR - 613 005

Title of the Course	INORGANIC CHEMISTRY –II						
Paper No.	CC14						
Category	Core	Year	III	Credits	5	Course Code	T6CH14
		Semester	VI				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	1	-			6	
Prerequisites	Inorganic Chemistry – I						
Objectives of the course	The course aims to provide knowledge on • tracer elements and their role in the biological system. • iron transport and storage • metallo enzymes, oxygen transport. • silicates and their applications • 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.
Extended Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31th ed., Milestone Publishers & Distributors, Delhi. 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4th 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	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited, Hyderabad 3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson, Chennai 4. Alan G. Sharp (1992), Inorganic Chemistry, 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	1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http:/swayam.gov.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: ability to explain the importance of tracer elements on biological system.

CO2: explain the metal ion transport, Bohr effect, Na, K, Ca pump.

CO3: explain the function of Vitamin B_{12}, Zn-Cu enzyme, ferredoxin, cluster enzymes.

CO4: classification and structure of silicates.

CO5: explain the manufacture of refractories, explosives, paints and pigments

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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TitleoftheCourse	Organic and Inorganic Preparations Practical-VI						
Paper No.	CC 15						
Category	Core	Year	III	Credits	4	Course Code	T6CH15P
		Semester	VI				
Instructional hoursperweek	Lecture	Tutorial	Lab Practice			Total	
	1	-	3			4	
Prerequisites	Theoretical knowledge on inorganic and organic compounds						
Objectivesoftheco urse	This course aims at providing • Preparation of Inorganic compounds. • Hands on experience in carrying out the experiments • Preparation of organic compounds						
CourseOutline	**UNIT-I** **Preparation of Inorganic compounds-** Potashalum Tetraammine copper(II) sulphate. Hexammine cobalt (III) chloride Mohr's Salt.						
	Unit-II **Preparation of Organic Compounds** 1. Nitration-picric acid from Phenol 2. Halogenation-p-bromo acetanilide from acetanilide 3. Oxidation-benzoic acid from Benzaldehyde 4. Microwave assisted reactions in water: 5. Methyl benzoate to Benzoicacid 6. Salicylicacid from Methyl Salicylate 7. Rearrangement-Benzil to BenzilicAcid 8. Hydrolysis of benzamide to BenzoicAcid						
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to **CO1:** assess the yield of different in organic preparations and identify the end point of various titrations. **CO2:** Explain the procedure, data and methodology for the practical work **CO3:** Apply the principles of inorganic chemistry for carrying out the practical work **CO4:**Demonstrate laboratory skills for safe handling of the equipment and chemicals							

Level of Correlation between PSO's and CO's

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

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HEAD OF THE DEPARTMENT OF CHEMISTRY
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Title of the Course	PHYSICAL CHEMISTRY-II						
Paper No.	EC9						
Category	Core	Year	III	Credits	3	Course Code	T6CHECK
		Semester	VI				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	5	1	-			6	
Prerequisites	Physical Chemistry - I						
Objectives of the course	The course aims at providing an overall view of the • 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 electrochemicalseries.						
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).						
	UNIT II **Chemical equilibrium** Law of mass action – thermodynamic derivation – relationship between Kpand Kc –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 –Lechatelier principle – van't Hoff reaction isotherm – temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clayperon equation – ClausiusClayperon 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.						
	UNIT IV **Electrical Conductance and Transference** Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; Debye Huckel theory –						

	Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. 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.
	UNIT V **Galvanic Cells and Applications** Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell. 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, 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, valency of ions, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations – acid base titrations, redox titrations, precipitation titrations; redox indicators - use of diphenylamine indicator in the titration of ferrous iron against dichromate.
Extended Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	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 physical chemistry, 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	1. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition,2009. 2. Gilbert. W. Castellen, Physical Chemistry, Narosa Publishing House, third edition, 1985. 3. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. 4. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 5. D.N.Bajpai, Advanced Physical Chemistry, S.Chand&Co., 2001
Website and e-learning source	https://nptel.ac.in https://swayam.gov.in https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_07_m.pdf Thermodynamics - NPTEL https://www.youtube.com/watch?v=f0udxGcoztE Introduction to chemical equilibrium – MIT opencourse ware

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

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.

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.

CO3: Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, partially miscible mixtures and immiscible liquids.

CO4: Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance.

CO5: Construct electrochemical cell with the help of electrochemical series and calculate cell EMF. Demonstrate the applications of EMF and significance of potentiometric titrations.

CO-PO Mapping (Course Articulation Matrix)

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

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">FUNDAMENTALS OF SPECTROSCOPY</td></tr>
<tr><td>Paper No.</td><td colspan="7">EC10</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective Course</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">T6CHECL</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="2">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">General Chemistry I,II,III and IV</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course is designed to provide knowledge on
• 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</td></tr>
<tr><td>Course Outline</td><td colspan="7">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
Selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications</td></tr>
<tr><td></td><td colspan="7">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 – 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.</td></tr>
</table>

	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) **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.
	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.
	UNIT V **Mass spectrometry** Principle – different kinds of ionisation – instrumentation – the massspectrum – 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).
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. *Elements of Analytical Chemistry*; S Chand: New Delhi, 2003. 2. Usharani, S. *Analytical Chemistry*, 1st ed.; Macmillan: India, 2002. 3. Banwell, C.N.; Mc Cash, E. M. *Fundamentals of Molecular Spectroscopy*, 4th ed.; Tata McGraw Hill, New Delhi, 2017. 4. U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand&Sons,2nd Ed., 2005 5. B.K.Sharma, Spectroscopy,22nd ed., Goel Publishing House, 2011.
Reference Books	1. Srivastava, A. K.; Jain, P. C. *Chemical Analysis an Instrumental Approach*, 3rd ed.; S.Chand, New Delhi, 1997. 2. Robert D Braun. *Introduction to Instrumental Analysis*; Mc.Graw Hill: New York, 1987. 3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. *Fundamentals of Analytical Chemistry*, 9th ed.; Harcourt college Publishers: USA, 2013. 4. Madan, R. L.; Tuli, G. D. *Physical Chemistry*, 2nd ed.; S.Chand: New Delhi, 2005. 5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. *Principles of Physical Chemistry*, 43rd ed.; Vishal Publishing: Delhi, 2008.
Website and e-learning source	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 Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain electrical and magnetic properties of materials and microwave spectroscopy

CO2: explain theory, instrumentation and applications of Infrared and Raman spectroscopy

CO3: apply selection rules to understand spectral transitions, explain Woodward – Fieser's rule for the calculation of wavelength maximum of conjugated dienes

CO4: explain theory, instrumentation and applications of NMR spectroscopy

CO5: explain theory, instrumentation and applications of Mass spectrometry

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

Signature of the HoD

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Title of the Course	**CHEMISTRY I** **(FOR MATHEMATICS, ZOOLOGY, BIOCHEMISTRY AND PHYSICS)**						
Paper No.	**GEC1**						
Category	**Generic Elective**	**Year**	I	**Credits**	3	**Course Code**	T1GCH1/ T3GCH1
		Semester	I/III				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	-				4	
Prerequisites	Higher secondary chemistry						
Objectives of the course	This course aims to provide knowledge on the • To acquire the knowledge of Acids and bases, buffer action • To learn about Polar Effects, Halogen Containing Compounds and Types of Solvents • To study the various concepts of Aromatic Compounds, Organic Reactions and Chemotherapy. • To get knowledge about Solid State, Energetic and Phase Rule. • To learn about the Chemical Equilibrium, Chemical Kinetics and Catalysis.						
Course Outline	**UNIT I** **Acids and Bases**: Arrhenius concept and limitations-Bronsted- lowry concept-conjugate acid and conjugate base -limitations– Lewis concept-examples of lewis acids and bases. Strength of acids and bases – strength of aliphatic acids-solvent that influence the strength of acids and bases - Defintion of pH pOH and Pka – ionic product of water – buffer solutions - buffer action - Henderson- Hasselbauch equations - Determination of pH by Colorimetric method.						
	Unit II **Polar Effects:** Inductive effect- Relative strength of aliphatic monocarboxylic acid and aliphatic amines.- Resonance- conditions for resonance, consequences of resonance- resonance energy. Basic property of aniline and acidic property of phenol - Hyper conjugation - consequences of hyperconjugation- Heat of hydrogenation, bond length and dipolemoment. Steric effect – steric accelerated reaction and steric inhibited reaction. **Halogen Containing Compounds:** Important chlorohydro carbon used as solvents and pesticides(Dichloromethane, chloroform, carbontetrachloride, DDT, BHC) Fluorocarbons (freons)- preparation , properties and uses **Types Of Solvents** – polar , nonpolar- dissolving nature.						

	UNIT III **Aromatic Compounds:** Structure , stability , resonance and aromaticity of benzene -Typical substitution reaction- i) Nitration ii) Halogenation iii) alkylation. (iv) acylation.(v)sulphonation **Chemotherapy:** Explanations with two examples each for i) Analgesics ii) Antibacterial iii)Anti- inflammatory, iv) Antipyretic , v) Antibiotic, vi)Antitubercular vii)Antiviral viii) Antitussive ix) Antiallergic x) Antidiabetics xi) antihypertensive xii) Antiepileptics xiii) Tranquilizers, xiv) Antiseptic and disinfectant xv)Antimalarial xvi) Anaesthetics (local and general). Structures not necessary.
	UNIT IV **Solid State:** Typical crystal lattices – unit cell. Elements of symmetry. Bragg's equation, Weiss indices, Miller indices, simple, body centered and face centered cubes – Crystal defects–point–line–planar–edge dislocation. **Phase Rule:** Phase, component, degrees of freedom, and phase rule definition. One component – water system. Reduced phase rule - two components – Pb-Ag system.
	UNIT V **Chemical Equilibrium**: Criteria of homogeneous and heterogeneous equilibria. Decomposition of HI, N_2O_4 and PCl_5 **Chemical Kinetics**: Definitions-Order and molecularity of reactions. Activation energy, Effect of temperature on reaction rate. **Catalysis :** Definition and examples: Positive and negative catalyst, homo and heterogeneous catalysis,autocatalysis and enzyme catalysis.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006. 3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninthedition, 2007.
Reference Books	1. P.L.Soni,MohanKatyal,Textbook of Inorganicchemistry;SultanChand and Company,New Delhi, twentieth edition, 2007. 2. B.R.Puri,L.R.Sharma,M.S.Pathania, TextbookPhysicalChemistry;VishalPublishingCo., New Delhi, fortyfortyseventh edition, 2018. 3.B.K,Sharma, IndustrialChemistry;GOELpublishinghouse,Meerut,16th edition, 2014.
	Course Learning Outcomes (for Mapping with POs and PSOs) **On completion of the course the students should be able to** **CO1:**Apply the principles of kinetics in calculating reaction rates, activation energies, and order of reactions **CO2:**Understand and appreciate the importance of phase rule and its applications and energetic **CO3:**Understand the utility of organic reactions and appreciate the structure-activity relationship of certain drugs **CO4:**Determine the rate law of chemical change based on experimental data **CO5:**Understand the concept of kinetics and catalysts

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

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">CHEMISTRY - II
(FOR MATHEMATICS, ZOOLOGY, BIOCHEMISTRY AND PHYSICS)</td></tr>
<tr><td>Paper No.</td><td colspan="7">G EC II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Generic Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">T2GCH2/ T4GCH3</td></tr>
<tr><td>Semester</td><td>II/IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td><td></td></tr>
<tr><td>4</td><td>-</td><td colspan="2">-</td><td colspan="2">4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="7">Chemistry for physical sciences -I</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims at providing knowledge on the
• To learn about Coordination Chemistry, Metallic Bond, Compounds of Sulphur in inorganic compounds.
• To acquire the knowledge of Carbohydrates,Amino Acids and Proteins,
• To study the various concepts and applications of Synthetic Polymers,Heterocyclic Compounds and Stereoisomerism.
• To understand the various ideas of colloids and photochemistry.
• To learn about the Electrochemistry.</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT I

Coordination Chemistry: Nomenclature of mononuclear complexes – Werner, Sidgwick, and Pauling's theories. Chelation and its industrial importance to EDTA. Biological role of heamoglobin and cholorophyll.

Metallic Bond: Electron gas, Pauling and band theories. Semiconductors- intrinsic, n –type and p-type.
Compounds of Sulphur: Peracids of sulphur and sodium thiosulphate.</td></tr>
<tr><td colspan="7">Unit II

Carbohydrates: Classification- glucose and fructose- preparation and properties of glucose- configuration of glucose – Fischer and Haworth cyclic structures. Sucrose, starch and cellulose – structure, properties and uses.

Amino Acids and Proteins: Amino acids- classification based on structure and essential and non- essential aminoacidspreparation and properties – peptides (elementary treatment) - proteins- classification based on physical properties and biological functions. Structures of proteins-primary and secondary (elementary treatment)</td></tr>
</table>

	UNIT III **Synthetic Polymers:**Teflon, alky and epoxy resins, poly esters-general treatment only. **Heterocyclic Compounds:** Furan, thiophen, pyrrole and pyridine – preparation and properties- basic properties of pyridine and Pyrrole. **Stereoisomerism:** Optical isomerism- lactic and tartaric acid-racemic mixture and resolution. Geometrical isomerism – maleic and fumaric acids. Meaning of E, Z, R,S,D, L, and meso in stereochemistry.
	UNIT IV **Colloids:** Emulsions, gels- preparation, properties and applications. Electrophoresis, chromatography- coloumn, paper and thin layer chromatography **Photochemistry:** Laws of photochemistry - lambert's law,lambert-beer law,Grothus-Drapper law,Einstein law of photochemical equivalence- photo synthesis- photoelectric effect.
	UNIT V **Electrochemistry:** Specific conductance, equivalent conductance and their determination using kohlraush bridge – effect of dilution on conductivity. An elementary idea about ionic theory- Ostwald's dilution law, Kohlrausch law, conductometric titrations-weak acid vs strong base only. Construction of standard hydrogen electrode – calomel electrode – Glass electrode – pH determination.
Extended Professional Component (is a part of internal component only, Not to be includedin the external examination question paper)	Questions related to the above topics, from various competitiveexaminations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006. 3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; SultanChand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; SultanChand and Company, New Delhi, twentieth edition, 2007. 2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018. 3. B.K,Sharma, Industrial Chemistry; GOEL, publishing, house, sixteenth edition, 2014.
Website and e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO 1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology

CO 2: Be able to preparation and properties of glucose

CO 3: Have acquired knowledge ofSynthetic Polymers, preparation and properties of Heterocyclic Compounds and stereoisomerism.

CO4: Have acquired knowledge of photochemistry and colloids

CO 5: Have knowledge ofElectrochemistry.

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

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Signature of the HoD

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<table>
<tr><td>Title of the Course</td><td colspan="7">CHEMISTRY PRACTICAL</td></tr>
<tr><td>Paper No.</td><td colspan="7">Generic Elective V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Generic Elective</td><td>Year</td><td>I/ II</td><td>Credits</td><td>1</td><td>Course Code</td><td>T2GCH2P/ T4GCH2P</td></tr>
<tr><td>Semester</td><td>II/IV</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>-</td><td colspan="3">3</td><td colspan="2">3</td></tr>
<tr><td>Prerequisites</td><td colspan="7"></td></tr>
<tr><td>Objectives of the course</td><td colspan="7">This course aims to provide knowledge on the
• basics of preparation of solutions.
• principles and practical experience of volumetric analysis
• identification of organic functional groups
• determination of elements in organic compounds.</td></tr>
<tr><td>Course Outline</td><td colspan="7">VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.</td></tr>
<tr><td></td><td colspan="7">ORGANIC ANALYSIS

A study of the reactions of the following organic compounds

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine
7. Phenol

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.</td></tr>
</table>

Reference Books	V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles ofPractical Chemistry; Sultan Chand & sons, Second edition, 1997.

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.
CO 2: design, carry out, record and interpret the results of volumetric titration.
CO 3: apply their skill in the analysis of water/hardness.
CO4: analyze the chemical constituents in allied chemical products
CO5: Know the various types of functional groups

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Signature of the HoD