

PERIYAR UNIVERSITY

NAAC 'A++' Grade with CGPA 3.61 (Cycle - 3)

Salem-636011, Tamilnadu, India.

SYLLABUS FOR M.Sc. CHEMISTRY DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM



**(For candidates admitted in the colleges affiliated to Periyar University
from 2023-2024 onwards)**

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005

M.Sc., Chemistry Programme.
Structure, course work, contact hours, credits and maximum internal and external marks for the students
admitted in 2023-2024

sem	Course	Title of the Course code	Contact Hr/Week	Credit	Int. Mark	Ext Mark	Total Mark
SEMESTER - I							
I	CORE COURSE-I	Organic Reaction Mechanism-I	7	5	25	75	100
	CORE COURSE-II	Structure and Bonding in Inorganic Compounds	7	5	25	75	100
	CORE COURSE-III	Organic Chemistry Practical	6	4	40	60	100
	ELECTIVE COURSE-I	PharmaceuticalChemistry / Nanomaterials and Nanotechnology	5	3	25	75	100
	ELECTIVE COURSE-II	Electrochemistry/Molecular Spectroscopy	5	3	25	75	100
			30	20			500
SEMESTER - II							
	CORE COURSE-IV	Organic reaction mechanism-II	6	5	25	75	100
	CORE COURSE-V	Physical Chemistry-I	6	5	25	75	100
	CORE COURSE-VI	Inorganic Chemistry Practical	6	4	40	60	100
	ELECTIVE COURSE-III	Medicinal Chemistry/Green Chemistry	4	3	25	75	100
II	ELECTIVE COURSE-IV	Bio Inorganic Chemistry/Material Science	4	3	25	75	100
		Human rights	-	1	25	75	100
	SKILL ENHANCEMENT COURSE-I (SEC-I)	Industrial chemistry	4	2	Internal Assessment		
			30	23	600		
SEMESTER - III							
	CORE COURSE-VII	Organic synthesis and Photochemistry	6	5	25	75	100
	CORE COURSE-VIII	Coordination Chemistry-I	6	5	25	75	100
	CORE COURSE-IX	Physical Chemistry Practical	6	5	40	60	100
III	ELECTIVE COURSE-V	Pharmacognosy and Phytochemistry/ Biomolecules And Heterocyclic Compounds	3	3	25	75	100
	Core (Industry Module)-X EDC	(Choose from outside the department)	6	4	25	75	100
	SKILL ENHANCEMENT COURSE-II (SEC-II)	Preparation of Consumer products	3	2	Internal Assessment		
	INTERNSHIP / INDUSTRIAL ACTIVITY	(Carried out in Summer Vacation at the end of I year – 30 hours)	-	2	-	-	-
			30	26			500
SEMESTER - IV							
IV							
	CORE COURSE-XI	Coordination Chemistry-II	6	5	25	75	100
	CORE COURSE-XII	Physical Chemistry-II	6	5	25	75	100
	CORE COURSE-XIII	Inorganic Estimations	6	3	40	60	100
	ELECTIVE COURSE-VI	Analytical Instrumentation technique Practical (Industry Entrepreneurship)	4	3	40	60	100
	CORE PROJECT	Core Project with viva voce	4	4	100	50+50	200
	SKILL ENHANCEMENT COURSE-III (SEC-III)	Professional Competency Skill Enhancement Course	4	2	Internal Assessment		
	EXTENSION ACTIVITY	Extension Activity	-	1	Performance based assessment		
			30	23			600
		TOTAL		92			2200

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1. Preamble

Taxonomy forms three learning domains: the cognitive (knowledge), affective (attitude), and psychomotor (skill). This classification enables to estimate the learning capabilities of students.

Briefly, it is aimed to restructure the curriculum as student-oriented, skill-based, and institution-industry-interaction curriculum with the various courses under

"Outcome Based Education with Problem Based Courses, Project Based Courses, and Industry Aligned Programmes" having revised Bloom's Taxonomy for evaluating students skills.

1. Cognitive Domain

(Lowerlevels:K1:Remembering;K2:Understanding;K3:Applying;Higherlevels:K4:Analysing;K5:Evaluating;K6:Creating)

2. Affective Domain

3. Psychomotor Domain

2. Structure of Course

Course Code	Course Name		Credits
Lecture Hours:(L) Per week	Tutorial Hours: (T) Per week	Lab Practice Hours: (P) Per week	Total:(L+T+P) Per week
Course Category:	Year &Semester:		Admission Year:
Pre-requisite			
Links to other Courses			
Learning Objectives:(for teachers: what they have to do in the class / lab / field)			
Course Outcomes:(for students: To know what they are going to learn)			
CO1:CO2:CO3:CO4: CO5:			
Recap:(not for examination)Motivation/previouslecture/relevantportionsrequiredforthe course)[This is done during 2 Tutorial hours)			
Units	Contents		Required Hours
I			15
II			15
III			15
IV			15
V			15

Extended Professional Component (is a par to internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics ,from various competitive examinations UPSC/TRB/NET/UGC– CSIR/GATE/TNPSC/others to be solved (To be discussed during the Tutorial hour)
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Skills acquired from the course	Knowledge ,Problem Solving ,Analytical ability ,Professional Competency Professional Communication and Transferrable Skill
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Learning Resources: • Recommended Texts • Reference Books • Web resources
Board of Studies Date:

3. Learning and Teaching Activities

3.1 Topic wise Delivery method

Hour Count	Topic	Unit	Mode of Delivery

3.2 Work Load

The information below is provided as a guide to assist students in engaging appropriately with the course requirements.

Activity	Quantity	Work load periods
Lectures	60	60
Tutorials	15	15
Assignments	5	5
Cycle Test or similar	2	4
Model Test or similar	1	3
University Exam	1	3
Total		90 Periods

Tutorial Activities

Tutorial Count	Topic
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4. Laboratory Activities

5. Field Study Activities

6. Assessment Activities

Assessment Principles:

Assessment for this courses based on the following principles

1. Assessment must encourage drain force learning.
2. Assessment must measure achievement to fthestatedlearningobjectives.
3. Assessment must enable robust and fair judgments about student performance.
4. Assessment practice must be fair and equitable to students and give them the Opportunity to demonstrate what they learned.
5. Assessment must maintain academic standards.

Assessment Details:

Assessment Item	Distributed Due Date	Weightage	Cumulative Weightage
Assignment1	3 rd week	2%	2%
Assignment2	6 th Week	2%	4%
Cycle Test–I	7 th Week	6%	10%
Assignment3	8 th Week	2%	12%
Assignment4	11 th Week	2%	14%
Cycle Test–II	12 th Week	6%	20%
Assignment5	14 th Week	2%	22%
Model Exam	15 th Week	13%	35%
Attendance	All weeks as per the Academic Calendar	5%	40%
University Exam	17 th Week	60%	100%

7. TEACHING METHODOLOGIES

- Traditional Teaching method like Chalk and Board, Virtual Classroom, LCD projector, Smart Class, Video Conference, Guest Lectures.
- Asking studentstoformulateaproblemfromatopiccoveredin aweek'stime Assignment, Class Test, Slip test
- Askingstudentstousestate-of-the-arttechnologies/softwaretosolveproblems Applications, Use of Chemdraw, Chempaint software
- Introducing students to applications before teaching the theory
- Training students to engage itself-study without relying on faculty (forexample–libraryandinternetsearch,manualandhandbookusage,etc.)
- Library ,Net Surfing, Manuals, NPTEL Course Materials published in the website
- Other university websites.
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8. Faculty Course File Structure CONTENT

- a. Academic Schedule**
- b. Students Name List**
- c. Time Table**
- d. Syllabus**
- e. Lesson Plan**
- f. Staff Work load**
- g. CourseDesign(content,CourseOutcomes(COs),Deliverymethod,mappingofCOswithProgrammeOutcomes(POs), Assessment Pattern in terms of Revised Bloom's Taxonomy)**
- h. Sample CO Assessment Tools.**
- i. Faculty Course Assessment Report(FCAR)**
- j. Course Evaluation Sheet**
- k. Teaching Materials (PPT, OHP etc)**
- l. Lecture Notes**
- m. Home Assignment Questions**
- n. Tutorial Sheets**
- o. Remedial Class Record, if any.**
- p. Projects related to the Course**
- q. Laboratory Experiments related to the Courses**
- r. Internal Question Paper**
- s. External Question Paper**
- t. Sample Home Assignment Answer Sheets**
- u. Three best ,three middle level and three average Answer sheets**
- v. Result Analysis(CO wise and whole class)**
- w. Question Bank for Higher studies Preparation(GATE/Placement)**
- x. List of mentees and their academic achievements**

9. Template for PG Programme in Chemistry

M.Sc, Chemistry Curriculum Design

Semester-I	Credit	Semester-II	Credit	Semester-III	Credit	Semester-IV	Credit
1.1.Core-I	5	2.1. Core-IV	5	3.1.Core-VII	5	4.1.Core-XI	5
1.2Core-II	5	2.2Core-V	5	3.2Core-VII	5	4.2Core-XII	5
1.3Core-III	4	2.3Core-VI	4	3.3Core-IX	5	4.3Core-XII -Inorganic Estimations	5
1.4Elective(Generic/ Discipline Centric)- I	3	2.4Elective(Generic/ Discipline Centric)- III	3	3.4Elective (Generic/Disciplin e Centric)-V	3	4.4Elective-VI(Industry Entrepreneurship)	4
1.5Elective(Generic/ Discipline Centric)-II	3	2.5Elective(Generic/ Discipline Centric)-IV	3	3.5CoreIndustry Module -X	4	4.5Core Project with Viva-Voce	4
		2.6SkillEnhancementCourse SEC-1	2	3.6 Skill Enhancement Course– Term Paper and Seminar Presentation SEC-2	2	4.6 Skill Enhancement Course – Professional Competency Skill-SEC-3	2
		2.7Human Rights	1	3.7Internship/Industrial Activity	2	4.7ExtensionActivity	1
	20		23		26		23
	Total Credit Points						92

Credit Distribution for PG Programme in Chemistry

M.Sc.,Chemistry

First Year Semester-I

	Courses	Credit	Hours per Week(L/T/P)
Part A	CoreCourses3(CC1,CC2,CC3)	14	20
	ElectiveCourses2(Generic/Discipline Specific)EC1,EC2	6	10
		20	30

Semester-II

	Courses	Credit	Hours per Week(L/T/P)
Part A	CoreCourses3(CC4,CC5,CC6)	14	18
	ElectiveCourse2 (Generic/Discipline Specific)EC3, EC4	6	8
Part B	SkillEnhancementCourse-SEC-1(One from Group G)	2	4
	Human Rights	1	
		23	30

Second Year-Semester-III

	Courses	Credit	Hours per Week(L/T/P)
Part A	CoreCourses3(CC7,CC8,CC9)	15	18
	ElectiveCourse1(Generic/Discipline Specific)EC5	3	3
	Core Industry Module-CC10	4	6
Part B	SkillEnhancementCourse-SEC3ProfessionalCommunication Skill(Term Paper & Seminar Presentation)	2	3
	Internship/Industrial Activity(Carried out in Summer Vacation at The end of I year– 30 hours)	2	-
		26	30

Semester-IV

Part	Courses	Credit	Hours per Week(L/T/P)
Part A	Core Courses 3(CC11,CC12)	10	12
	Inorganic Estimations	5	6
	Elective Course (Generic/Discipline Specific) EC6	3	5
	Project with Viva voce(CC13)	3	5
Part B	Professional Competency Skill Enhancement Course Training for Competitive Examinations - Chemistry for NET/UGC-CSIR/SET/ TRB Competitive Examinations(2hours) - General Studies for UPSC/TNPSC/Other Competitive Examinations(2h ours) OR	2	3
	Chemistry for Advanced Research Studies(4hours)		
Part C	Extension Activity(Can be carried out from Sem II to Sem IV)	1	
		23	30

Component wise Credit Distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total
Part- A	20	20	22	20	82
Part –B (i) SEC	-	2	2	2	10
(ii)Summer Internship/Industrial Training			2		
Part –C Extension Activity				1	
Human Rights		1			
Total	20	23	26	23	92

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components Part B and Part C have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the PG degree

Credit Distribution for PG Programme in Chemistry
M.Sc. Chemistry

Illustration-I

	First Year Semester-I	Credit	Hours per week(L/T/P)
PartA	CC1–Organic Reaction Mechanism-I	5	7(5L+ 2T)
	CC2–Structure and Bonding in Inorganic Compounds	5	7(5L+ 2T)
	CC3 –Organic Chemistry Practical	4	6(5L+ 1T)
	Elective -I (Generic/Discipline Specific) (One from Group A) Pharmaceutical Chemistry/Nano materials and Nanotechnology	3	5(4L+ 1T)
	Elective-II (Generic/Discipline Specific) (One from Group B) Electrochemistry/Molecular Spectroscopy	3	5(4L+ 1T)
	Total	20	30

	Semester-II	Credit	Hours per week(L/T/P)
PartA	CC4–Organic reaction mechanism-II	5	6(5L+ 1T)
	CC5–Physical Chemistry-I	5	6(5L+ 1T)
	CC6–Inorganic Chemistry Practical	4	6(5L+ 1T)
	Elective-III (Generic/Discipline Specific) (One from Group C) Medicinal Chemistry/Green Chemistry	3	4
	Elective-IV (One from Group D) Bio Inorganic Chemistry/Material Science	3	4
	PartB SkillEnhancementCourse-SEC-1(One from Group G)	2	4
	Human Rights	1	
	Total	23	30

	Second Year - Semester-III	Credit	Hours per week(L/T/P)
PartA	CC7– Organic synthesis and Photochemistry	5	6(5L+ 1T)
	CC8 –Coordination Chemistry-I	5	6(5L+ 1T)
	CC9 – Physical Chemistry Practical	5	6(5L+ 1T)
	Elective-V(Generic/Discipline Specific) (One from GroupE) Pharmacognosy and Phytochemistry/ Biomolecules And Heterocyclic Compounds	3	3
	Core Industry Module CC-10	4	6
PartB	Internship/Industrial Activity (Carried out in Summer Vacation at the end of I year–30hours)	2	
	Skill Enhancement Course-SEC-2	2	3
	Total	26	30

	Semester-IV	Credit	Hours per week(L/T/P)
PartA	CC11–Coordination Chemistry-II	5	6(5L+ 1T)
	CC12–Physical Chemistry-II	5	6(5L+ 1T)
	CC13– Inorganic Estimation	3	6(5L+ 1T)
	Elective-VI Analytical Instrumentation technique Practical ((Industry Entrepreneurship)	3	4
	Core Project with vivavoce	4	4
PartB	Professional Competency Skill Enhancement Course Training for Competitive Examinations Chemistry for NET/UGC-CSIR/SET/TRB Competitive Examinations(2hours) General Studies for UPSC/TNPSC/Other Competitive Examinations(2hours) OR Chemistry for Advanced Research Studies(4hours)	2	4
PartC	Extension Activity	1	
	Total	23	30

TOTAL CREDITS: 92

10. Template for Semester

Code	Category	Title of the Paper	Marks (Max100)		Durationfor UE	Credits
			CIA	UE		
Semester-I						
Part A	Core I		25	75	3Hrs	5
	Core II		25	75	3Hrs	5
	Core III		40	60	6Hrs	4
	Elective I	Elective-I(Choose one from Group-A)	25	75	3Hrs	3
	Elective II	Elective-II(Choose one from Group-B)	25	75	3Hrs	3
Semester-II						
Part A	Core IV		25	75	3Hrs	5
	Core V		25	75	3Hrs	5
	Core VI		40	60	6Hrs	4
	Elective III	Elective-III (Choose one from Group-C)	25	75	3Hrs	3
	Elective IV	Elective-IV(Choose one from Group-D)	25	75	3Hrs	3
	Human Rights		25	75	3Hrs	1
Part B	Skill Enhance ment Course-SEC-1	(Choose one from Group-G)	Internal Assessment			2

Semester-III						
Part A	Core VII		25	75	3Hrs	5
	Core VIII		25	75	3Hrs	5
	Core IX		40	60	6Hrs	5
	Elective/EDV	Elective-VI /ED-V(Choose one from Group-E)	25	75	3Hrs	3
	Industry Module- Core-X	(Choose from outside the Department)	25	75	3Hrs	4
Part B						
	Skill Enhancement Course-SEC-2	(Choose one from Group-G)				2
	Internship/Industrial- Vacation Activity					2
Semester-IV						
Part A	Core XI		25	75	3Hrs	5
	Core XII		25	75	3Hrs	5
	Core XIII		40	60	6Hrs	3
	Project with viva voce		100	100	3Hrs	4
	Elective VI	Elective-VI Analytical Instrumentation technique Practical (Industry Entrepreneurship)	40	60	6Hrs	3
Part B	Skill Enhancement Course-SEC-3	Professional Competency Skill Enhancement Course	Internal Assessment			2
PartC	Extension Activity	Performance based assessment				1
Total Credits						92

Elective Courses

Courses are grouped (Group A to Group F) so as to include topics from

Pure Chemistry (PC), Applied Chemistry (AC) and Industrial Components(IC) like pharmaceutical industries, Polymer lab sources for flexibility of choice by the stakeholders/institutions.

Semester I: Elective I and Elective II

Elective I to be chosen from Group A and Elective II to be chosen from Group B

Group A: (PC/AC/IC)

1. Pharmaceutical Chemistry
2. Nanomaterials and Nanotechnology

Group B: (PC/AC/IC)

1. Electrochemistry
2. Molecular Spectroscopy

Semester II: Elective III & Elective IV

Elective III to be chosen from Group C and Elective IV to be chosen from Group D
Group C: (PC/AC/IC)

1. Medicinal Chemistry
2. Green Chemistry

Group D: (PC/AC/IC)

1. Bioinorganic Chemistry
2. Material Science

Semester III: Elective V

Elective V to be chosen from Group E.

Group E: (PC/AC/IC)

1. Pharmacognosy and Phytochemistry
2. Biomolecules and Heterocyclic compounds

Semester IV: Elective VI

Elective VI to be chosen from Group F.

Group F: (PC/AC/IC)

1. Chemistry of Natural products
2. Polymer Chemistry

Skill Enhancement Courses

Skill Enhancement Courses are chosen to keep in pace with the latest developments in the academic / industrial front and provides flexibility of choice by the stakeholders /institutions.

Group G (Skill Enhancement Courses)SEC:(Practical based paper)

- Computational Chemistry
- 3D printing in Chemistry
- Preparation of Consumer products
- Chemistry in everyday life
- Cosmetic Chemistry
- Origin lab
- Industrial Chemistry
- Research Tools and Techniques

Ability Enhancement Courses

- Soft Skill courses

Extra Disciplinary Courses for other Departments (not for Mathematics students)

Students from other Departments may also choose any one of the following as Extra Disciplinary Course.

ED-I: Chemistry for Life Sciences

ED-II: Chemical conservation

ED-III: Chemistry in food preservation

ED-IV: Chemistry for Social studies

ED-V: Chemistry in consumer products

11. Instructions for Course Transaction

Courses	Lecture Hrs	Tutorial hrs	Lab Practice	Total hrs
Core	75	15	--	90
Electives	75	15	--	90
ED	75	15	--	90
Lab Practice Courses	-	15	75	90
Project	20	--	70	90

12. Testing Pattern (25+75)**13.1 Internal****Assessment**

Theory Course: For theory courses there shall be three tests conducted by the faculty concerned and the average of the best two can be taken as the Continuous Internal Assessment (CIA) for a maximum of 25 marks. The duration of each test shall be one/one and half hour.

Computer Laboratory Courses: For Computer Laboratory Oriented Courses, there shall be two tests in Theory part and two tests in Laboratory part. Choose one best from Theory part and other best from the two Laboratory part. The average of the best two can be treated as the CIA for a maximum of 25 marks. The duration of each test shall be one/one and a half hour.

There is no improvement for CIA of both theory and laboratory, and, also for University End Semester Examination.

13.2 Written Examination: Theory Paper (Bloom's Taxonomy based)**Question Paper Model**

Intended Learning Skills	Maximum 75 Marks Passing Minimum: 50% Duration: Three Hours
	Part-A (10x2 = 20 Marks) Answer ALL questions Each Question carries 2 marks
Memory Recall/ Example/ Counter Example/Knowledge about the Concepts/Understanding	Two questions from each unit
	Question 1 to Question 10
	Part-B (5x5 = 25 Marks) Answer ALL questions Each question carries 5 Marks
Descriptions/Application (problems)	Either-or Type Both parts of each question from the same unit
	Question 11(a) or 11(b) To Question 15(a) or 15(b)
	Part-C (3x 10 = 30 Marks) Answer any THREE questions Each question carries 10 Marks
Analysis/Synthesis/Evaluation	There shall be FIVE questions covering all the five units
	Question 16 to Question 20

Each question should carry the course outcome and cognitive level for instance,

1. [CO1:K2]Question xxxx
2. [CO3:K1]Question xxxx

14. Different Types of Courses

(i) Core Courses(Illustrative)

1. Organic Reaction mechanism I & II
2. Structure and bonding in Inorganic compounds
3. Organic Chemistry Practical
4. Physical Chemistry-I & II
5. Inorganic Chemistry Practical
6. Organic synthesis and Photochemistry
7. Coordination Chemistry-I & II
8. Physical Chemistry Practical
9. Analytical Instrumentation technique practical

(ii) Elective Courses (ED within the Department Experts) (Illustrative)

1. Pharmaceutical Chemistry
2. Nanomaterials and Nanotechnology
3. Electrochemistry
4. Molecular Spectroscopy
5. Medicinal Chemistry
6. Green Chemistry
7. Pharmacognosy and Phytochemistry
8. Biomolecules and Heterocyclic compounds
9. Bio inorganic Chemistry
10. Material Science
11. Chemistry of Natural products
12. Polymer chemistry

(iii) Elective Courses (ED from other Department Experts)

(iv) Skill Development Courses

(v) Institution-Industry-Interaction (Industry aligned Courses)

Programmes /course work/field study/Modeling the Industry Problem/Statistical Analysis/Commerce-Industry related problems/MOU with Industry and the like activities.

TANSCHÉ REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION	
Programme	M.Sc.
Programme Code	
Duration	2 years for PG
Programme Outcomes (Pos)	PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context. PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making. PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities. PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills. PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals. PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment. PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur. PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society. PO 9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective. PO 10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life.
Programme Specific Outcomes (PSOs)	PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions. PSO 2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations. PSO3 – Research and Development Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development. PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world. PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

Title of the Course	ORGANIC REACTION MECHANISM - I						
Paper No.	Core I						
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	4	1	-			5	
Prerequisites	Basic concepts of organic chemistry						
Objectives of the course	To understand the feasibility and the mechanism of various organic reactions. To comprehend the techniques in the determination of reaction mechanisms. To understand the concept of stereochemistry involved in organic compounds. To correlate and appreciate the differences involved in the various types of organic reaction mechanisms. To design feasible synthetic routes for the preparation of organic compounds.						
Course Outline	UNIT-I: Methods of Determination of Reaction Mechanism: Reaction intermediates, The transition state, Reaction coordinate diagrams, Thermodynamic and kinetic requirements of reactions: Hammond postulate. Methods of determining mechanism: non-kinetic methods - product analysis, determination of intermediates-isolation, detection, and trapping. Cross-over experiments, isotopic labelling, isotope effects and stereochemical evidences. Kinetic methods - relation of rate and mechanism. Effect of structure on reactivity: Hammett and Taft equations. Linear free energy relationship, partial rate factor, substituent and reaction constants. UNIT-II: Aromaticity, Aromatic and Aliphatic Electrophilic Substitution: Aromaticity in benzenoid, non-benzenoid, heterocyclic compounds and annulenes. Aromatic electrophilic substitution: Orientation and reactivity of di- and polysubstituted phenol, nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: sulphonation; Halogen electrophiles: chlorination and bromination; Carbon electrophiles: Friedel-Crafts alkylation, acylation and arylation reactions. Aliphatic electrophilic substitution Mechanisms: S_E2 and S_Ei, S_E1- Mechanism and evidences.						

	UNIT-III:Aromatic and Aliphatic Nucleophilic Substitution: Aromatic nucleophilic substitution: Mechanisms - S_NAr, S_N1 and Benzyne mechanisms - Evidences - Reactivity, Effect of structure, leaving group and attacking nucleophile. Reactions: Oxygen and Sulphur-nucleophiles, Bucherer and Rosenmund reactions, von Richter, Sommelet- Hauser and Smiles rearrangements. S_N1, ion pair, S_N2 mechanisms and evidences. Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon. S_N1, S_N2, S_Ni, and S_E1 mechanism and evidences, Swain- Scott, Grunwald-Winstein relationship - Ambident nucleophiles.
	UNIT-IV:Stereochemistry-I: Introduction to molecular symmetry and chirality – axis, plane, center, alternating axis of symmetry. Optical isomerism due to asymmetric and dissymmetric molecules with C, N, S based chiral centers. Optical purity, prochirality, enantiotopic and diastereotopic atoms, groups, faces, axial and planar chirality, chirality due to helical shape, methods of determining the configuration. Racemic modifications: Racemization by thermal, anion, cation, reversible formation, epimerization, mutarotation. D, L system, Cram's and Prelog's rules: R, S-notations, proR, proS, side phase and re phase Cahn-Ingold-Prelog rules, absolute and relative configurations. Configurations of allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclic alkylidene-cycloalkanes. Topicity and prostereoisomerism, chiral shift reagents and chiral solvating reagents. Criteria for optical purity: Resolution of racemic modifications, asymmetric transformations, asymmetric synthesis, destruction. Stereoselective and stereospecific synthesis.
	UNIT-V:Stereochemistry-II: Conformation and reactivity of acyclic systems, intramolecular rearrangements, neighbouring group participation, chemical consequence of conformational equilibrium - Curtin-Hammett Principle. Stability of five and six-membered rings: mono-, di- and polysubstituted cyclohexanes, conformation and reactivity in cyclohexane systems. Fused and bridged rings: bicyclic, poly cyclic systems, decalins and Bredt's rule. Optical rotation and optical rotatory dispersion, conformational asymmetry, ORD curves, octant rule, configuration and conformation, Cotton effect, axial haloketone rule and determination of configuration.

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J. March and M. Smith, Advanced Organic Chemistry, 5th edition, John-Wiley and Sons.2001. 2. E. S. Gould, Mechanism and Structure in Organic Chemistry, Holt, Rinehart and Winston Inc., 1959. 3. P.S.Kalsi, Stereochemistry of carbon compounds, 8th edition, New Age International Publishers, 2015. 4. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013. 5. J.Clayden, N. Greeves, S. Warren, Organic Compounds, 2nd edition, Oxford University Press, 2014.
Reference Books	1. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part-A and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007. 2. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 2001. 3. N.S. Isaacs, Physical Organic Chemistry, ELBS, Longman, UK, 1987. 4. E. L. Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000. 5. I. L. Finar, Organic chemistry, Vol-1&2, 6th edition, Pearson Education Asia, 2004.
Website and e-learning source	1. https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able CLO1: To recall the basic principles of organic chemistry. CLO2: To understand the formation and detection of reaction intermediates of organic reactions. CLO3: To predict the reaction mechanism of organic reactions and stereochemistry of organic compounds. CLO4: To apply the principles of kinetic and non-kinetic methods to determine the mechanism of reactions. CLO5: To design and synthesize new organic compounds by correlating the stereochemistry of organic compounds.	

CO-PO Mapping (Course Articulation Matrix)

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

Strong - 3**Medium-2****Low-1**

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

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

In order to avoid pull the score down of each PO, it is suggested that the usage L-Low (1) to the minimum.

The S, M, L is based on the course outcome. The mapping is based on the revised Bloom's Taxonomy Verbs used to describe your course outcome.

- Remember and Understanding – Lower level
- Apply and Analyze – Medium Level
- Evaluate and Create – Strong Level

	structures. Crystal Growth methods: From melt and solution (hydrothermal, sol-gel methods) – principles and examples.
	UNIT-IV: Techniques in solid state chemistry: X-ray diffraction technique: Bragg's law, Powder diffraction method – Principle and Instrumentation; Interpretation of XRD data – JCPDS files, Phase purity, Scherrer formula, lattice constants calculation; Systematic absence of reflections; Electron diffraction technique – principle, instrumentation and application. Electron microscopy – difference between optical and electron microscopy, theory, principle, instrumentation, sampling methods and applications of SEM and TEM.
	UNIT-V: Band theory and defects in solids Band theory – features and its application of conductors, insulators and semiconductors, Intrinsic and extrinsic semiconductors; Defects in crystals – point defects (Schottky, Frenkel, metal excess and metal deficient) and their effect on the electrical and optical property, laser and phosphors; Linear defects and its effects due to dislocations.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. A R West, Solid state Chemistry and its applications, 2nd Edition (Students Edition), John Wiley & Sons Ltd., 2014. 2. A K Bhagi and G R Chatwal, A textbook of inorganic polymers, Himalaya Publishing House, 2001. 3. L Smart, E Moore, Solid State Chemistry – An Introduction, 4th Edition, CRC Press, 2012. 4. K. F. Purcell and J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977. 5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry; 4th ed.; Harper and Row: New York, 1983.
Reference Books	1. D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and Models in Inorganic Chemistry, 3rd Ed, 1994. 2. R J D Tilley, Understanding Solids - The Science of Materials, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State

	Chemistry, 2 nd Edition, Cambridge University Press, 199. 4. T. Moeller, Inorganic Chemistry, A Modern Introduction; John Wiley: New York, 1982. 5. D. F. Shriver, P. W. Atkins and C.H. Langford; Inorganic Chemistry; 3rd ed.; Oxford University Press: London, 2001.
Website and e-learning source	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able CO1: Predict the geometry of main group compounds and clusters. CO2: Explain about the packing of ions in crystals and apply the radius ratio rule to predict the coordination number of cations. CO3: Understand the various types of ionic crystal systems and analyze their structural features. CO4: Explain the crystal growth methods. CO5: To understand the principles of diffraction techniques and microscopic techniques.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

Recommended Text	1. B.S. Furniss, A.J. Hannaford, P.W.G. Smith and A.R. Tatchell, Vogel's Practical Organic Chemistry. 5th edn. ELBS, 1989 2. Raj K. Bansal, Laboratory manual of Organic Chemistry, III Edn., New Age International (P) Ltd. 1996. 3. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry Lab Manual, New Ed., SV Publishers 2006 4. Chemdraw 8.0 to 16.0, Perkin Elmer-User Guide Version 16.0, CambridgeSoft Corporation.
Reference Books	1. B.S. Furniss, A.J. Hannaford, P.W.G. Smith and A.R. Tatchell, Vogel's Practical Organic Chemistry. 5th edn. ELBS, 1989 2. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry Lab Manual, New Ed., SV Publishers 2006 3. P. S. Subramanian, R. Gopalan, K. Rangarajan, Elements of Analytical Chemistry, Sultan Chand & Sons, New Delhi, 2003.
Website and e-learning source	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the basic principles of organic separation, qualitative analysis and preparation. CO2: To explain the method of separation and analysis of separated organic mixtures and convert them as derivatives by suitable preparation method. CO3: To determine the characteristics of separation of organic compounds by various chemical reactions. CO4: To develop strategies to separate, analyze and prepare organic compounds. CO5: To formulate a method of separation, analysis of organic mixtures and design suitable procedure for organic preparations.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms. Drug dosage and product development. Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and control, pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms. UNIT-IV: Development of new drugs: Introduction, procedure followed in drug design, the research for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect, isomerism, bioisosterism, spatial considerations, biological properties of simple functional groups, theories of drug activity, occupancy theory, rate theory, induced-fit theory, 4.3 Quantitative structure activity relationship (QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionization constants, steric parameters, chelation parameters, redox potential, indicator-variables. UNIT-V: Computers in Pharmaceutical Chemistry: Need of computers for chemistry. Computers for Analytical Chemists- Introduction to computers: Organization of computers, CPU, Computer memory, I/O devices, information storage, software components. Application of computers in chemistry: Programming in high level language (C++) to handle various numerical methods in chemistry – least square fit, solution to simultaneous equations, interpolation, extrapolation, data smoothing, and numerical differentiation and integrations.
Extended Professional Component (is a part of internal component only, Not to be included)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE / TNPSC others to be solved (To be discussed during the Tutorial hours)

in the external examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Physical Chemistry- Bahl and Tuli. 2. Text Book of Physical Pharmaceutics, IInd edition, Vallabh Prakashan-.C.V.S. Subramanyam. 3. Medicinal Chemistry (Organic Pharmaceutical Chemistry), G.R Chatwal, Himalaya Publishing house. 4. Instrumental method of Analysis: Hubert H, Willard, 7th edition. 5. Textbook of Pharmaceutical Chemistry by, Jaysree Ghosh, S. Chand & company Ltd. Pharmaceutical Chemistry by Dr. S. Lakshmi, Sultanchand & Sons.
Reference Books	1. Computers in chemistry, K.V. Raman, Tata Mc.Graw-Hill, 1993. 2. Computers for Chemists, S.K Pundir, Anshu bansal, A pragate prakashan., 2 nd edition, New age international (P) limited, New Delhi. 3. Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins. 4. Cooper and Gunn's Tutorial Pharmacy ,6th edition by S.J. Carter, CBS Publisher Ltd. 5. Ansels pharmaceutical Dosage forms and Drug Delivery System by Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd.
Website and e-learning source	https://www.ncbi.nlm.nih.gov/books/NBK482447/ https://training.seer.cancer.gov/treatment/chemotherapy/types.html
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To identify the suitable drugs for various diseases. CO2: To apply the principles of various drug action and drug design. CO3: To acquire the knowledge on product development based on SAR. CO4: To apply the knowledge on applications of computers in chemistry. CO5: To synthesize new drugs after understanding the concepts SAR.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /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

3 – Strong, 2 – Medium, 1 - Low

	materials as p and n –type semiconductor-Hall effect - quantum and anomalous, Hall voltage - interpretation of charge carrier density. Applications of semiconductors: p-n junction as transistors and rectifiers, photovoltaic and photogalvanic cell. UNIT-V:Nano thin films, nanocomposites Application of nanoparticles in different fields. Core-shellnanoparticles-types,synthesis, andproperties. Nanocomposites-metal-,ceramic-andpolymer-matrixcomposites-applications. Characterization–SEM, TEM and AFM- principle, instrumentationand applications.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. S.Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications,2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Reference Books	1. S.Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications,2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Website and e-learning source	1. http://xrayweb.chem.ou.edu/notes/symmetry.html. 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf.
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To explain methods of fabricating nanostructures. CO2: To relate the unique properties of nanomaterials to reduce dimensionality of the	

material.

CO3: To describe tools for properties of nanostructures.

CO4: To discuss applications of nanomaterials.

CO5: To understand the health and safety related to nanomaterial.

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /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

3 – Strong, 2 – Medium, 1 - Low

	UNIT-III:Electrodics of Elementary Electrode Reactions: Behavior of electrodes: Standard electrodes and electrodes at equilibrium. Anodic and Cathodic currents, condition for the discharge of ions. Nernst equation,polarizable and non-polarizable electrodes. Model of three electrode system, over potential.Rate of electro chemical reactions: Rates of simple elementary reactions. Butler-Volmer equation-significance of exchange current density, net current density and symmetry factor. Low and high field approximations. symmetry factor and transfer coefficient Tafel equations and Tafel plots. UNIT-IV:Electrodics of Multistep Multi Electron System: Rates of multi-step electrode reactions, Butler - Volmer equation for a multi-step reaction. Rate determining step, electrode polarization and depolarization. Transfer coefficients, its significance and determination,Stoichiometric number. Electro-chemical reaction mechanisms-rate expressions, order, and surface coverage. Reduction of I^{3-}, Fe^{2+}, and dissolution of Fe to Fe^{2+}. Overvoltage - Chemical and electro chemical, Phase, activation and concentration over potentials. Evolution of oxygen and hydrogen at different pH. Pourbiax and Evan's diagrams. UNIT-V:Concentration Polarization, Batteries and Fuel cells: Modes of Transport of electro active species - Diffusion, migration and hydrodynamic modes. Role of supporting electrolytes. Polarography-principle and applications. Principle of square wave polarography. Cyclic voltammetry- anodic and cathodic stripping voltammetry and differential pulse voltammetry. Sodium and lithium-ion batteries and redox flow batteries. Mechanism of charge storage: conversion and alloying. Capacitors- mechanism of energy storage, charging at constant current and constant voltage.Energy production systems: Fuel Cells: classification, alkaline fuel cells, phosphoric acid fuel cells, high temperature fuel cells.
Extended Professional Component (is a part of internal component only, Not to be included	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)

in the external examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. D. R. Crow, Principles and applications of electrochemistry, 4th edition, Chapman & Hall/CRC, 2014. 2. J. Rajaram and J.C. Kuriakose, Kinetics and Mechanism of chemical transformations Macmillan India Ltd., New Delhi, 2011. 3. S. Glasstone, Electro chemistry, Affiliated East-West Press, Pvt., Ltd., New Delhi, 2008. 4. B. Viswanathan, S. Sundaram, R. Venkataraman, K. Rengarajan and P.S. Raghavan, Electrochemistry-Principles and applications, S. Viswanathan Printers, Chennai, 2007. 5. Joseph Wang, Analytical Electrochemistry, 2nd edition, Wiley, 2004.
Reference Books	1. J.O.M. Bockris and A.K.N. Reddy, Modern Electro chemistry, vol.1 and 2B, Springer, Plenum Press, New York, 2008. 2. J.O.M. Bockris, A.K.N. Reddy and M.G. Aldeco Morden Electro chemistry, vol. 2A, Springer, Plenum Press, New York, 2008. 3. Philip H. Rieger, Electrochemistry, 2nd edition, Springer, New York, 2010. 4. L.I. Antropov, Theoretical electrochemistry, Mir Publishers, 1977. 5. K.L. Kapoor, A Text book of Physical chemistry, volume-3, Macmillan, 2001.
Website and e-learning source	1. https://www.pdfdrive.com/modern-electrochemistry-e34333229.
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To understand the behaviour of electrolytes in solution and compare the structures of electrical double layer of different models. CO2: To predict the kinetics of electrode reactions applying Butler-Volmer and Tafel equations CO3: To study different thermodynamic mechanism of corrosion, CO4: To discuss the theories of electrolytes, electrical double layer, electrodicts and activitycoefficient of electrolytes CO5:To have knowledge on storage devices and electrochemical reaction mechanism.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	UNIT-III:Electronic spectroscopy: Electronic Spectroscopy: Electronic spectroscopy of diatomic molecules, Frank-Condon principle, dissociation and predissociation spectra. $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ transitions and their selection rules. Photoelectron Spectroscopy: Basic principles, photoelectron spectra of simple molecules, Xray photoelectron spectroscopy (XPS). Lasers: Laser action, population inversion, properties of laser radiation, examples of simple laser systems.
	UNIT-IV: NMR and Mass Spectrometry: Chemical shift, Factors influencing chemical shifts: electronegativity and electrostatic effects; Mechanism of shielding and deshielding. Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions: Homonuclear coupling interactions - AX, AX₂, AB types. Vicinal, germinal and long-range coupling-spin decoupling. Nuclear Overhauser effect (NOE), Factors influencing coupling constants and Relative intensities. ¹³CNMR and structural correlations, Satellites. Brief introduction to 2D NMR – COSY, NOESY. Introduction to ³¹P, ¹⁹F NMR. Mass Spectrometry: Ionization techniques- Electron ionization (EI), chemical ionization (CI), desorption ionization (FAB/MALDI), electrospray ionization (ESI), isotope abundance, molecular ion, fragmentation processes of organic molecules, deduction of structure through mass spectral fragmentation, high resolution. Effect of isotopes on the appearance of mass spectrum.
	UNIT-V:ESR and Mossbauer Spectroscopy: ESR spectroscopy Characteristic features of ESR spectra, line shapes and line widths; ESR spectrometer. The g value and the hyperfine coupling parameter (A), origin of hyperfine interaction. Interpretation of ESR spectra and structure elucidation of organic radicals using ESR spectroscopy; Spin orbit coupling and significance of g-tensors, zero/non-zero field splitting, Kramer's degeneracy, application to transition metal complexes (having one to five unpaired electrons) including biological molecules and inorganic free radicals. ESR spectra of magnetically dilute samples. Structural elucidation of organic

	compounds by combined spectral techniques. Principle of Mossbauer spectroscopy: Doppler shift, recoil energy. Isomer shift, quadrupole splitting, magnetic interactions. Applications: Mossbauer spectra of high and low-spin Fe and Sn compounds.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. C. N. Banwell and E. M. McCash, <i>Fundamentals of Molecular Spectroscopy</i>, 4th Ed., Tata McGraw Hill, New Delhi, 2000. 2. R. M. Silverstein and F. X. Webster, <i>Spectroscopic Identification of Organic Compounds</i>, 6th Ed., John Wiley & Sons, New York, 2003. 3. W. Kemp, <i>Applications of Spectroscopy</i>, English Language Book Society, 1987. 4. D. H. Williams and I. Fleming, <i>Spectroscopic Methods in Organic Chemistry</i>, 4th Ed., Tata McGraw-Hill Publishing Company, New Delhi, 1988. 5. R. S. Drago, <i>Physical Methods in Chemistry</i>; Saunders: Philadelphia, 1992.
Reference Books	1. P.W. Atkins and J. de Paula, <i>Physical Chemistry</i>, 7th Ed., Oxford University Press, Oxford, 2002. 2. I. N. Levine, <i>Molecular Spectroscopy</i>, John Wiley & Sons, New York, 1974. 3. A. Rahman, <i>Nuclear Magnetic Resonance-Basic Principles</i>, Springer-Verlag, New York, 1986. 4. K. Nakamoto, <i>Infrared and Raman Spectra of Inorganic and coordination Compounds</i>, PartB: 5th ed., John Wiley& Sons Inc., New York, 1997. 5. J. A. Weil, J. R. Bolton and J. E. Wertz, <i>Electron Paramagnetic Resonance</i>; Wiley Interscience, 1994.
Website and e-learning source	1. https://onlinecourses.nptel.ac.in/noc20_cy08/preview 2. https://www.digimat.in/nptel/courses/video/104106122/L14.html
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To understand the importance of rotational and Raman spectroscopy. CO2: To apply the vibrational spectroscopic techniques to diatomic and polyatomic molecules. CO3: To evaluate different electronic spectra of simple molecules using electronic spectroscopy. CO4: To outline the NMR, ¹³C NMR, 2D NMR – COSY, NOESY, Introduction to ³¹P,	

¹⁹FNMR and ESR spectroscopic techniques.

CO5: To develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques.

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

SEMESTER-II

	Kishner, Clemmenson, Rosenmund, reduction with Trialkyl and triphenyltin hydrides, McFadyen-Steven's reduction, Homogeneous hydrogenation, Hydroboration with cyclic systems, MPV and Bouveault-Blanc reduction. UNIT-III:Rearrangements: Rearrangements to electron deficient carbon: Pinacol-pinacolone and semi-pinacolone rearrangements -applications and stereochemistry, Wagner-Meerwein, Demjanov, Dienone-phenol, Baker-Venkataraman, Benzilic acid and Wolff rearrangements.Rearrangements to electron deficient nitrogen: Hofmann, Curtius, Schmidt, Lossen, Beckmann and abnormal Beckmann rearrangements. Rearrangements to electron deficient oxygen: Baeyer-Villiger oxidation and Dakin rearrangements. Rearrangements to electron rich atom: Favorskii, Quasi-Favorskii, Stevens, [1,2]-Wittig and [2,3]-Wittig rearrangements.Fries and Photo Fries rearrangement.Intramolecular rearrangements – Claisen, abnormal Claisen, Cope, oxy-Cope Benzidine rearrangements. UNIT-IV: Addition to Carbon Multiple Bonds and Mechanisms: (a) Addition to carbon-carbon multiple bonds- Addition reactions involving electrophiles, nucleophiles, free radicals, carbenes and cyclic mechanisms-Orientation and reactivity, hydrogenation of double and triple bonds, Michael reaction, addition of oxygen and Nitrogen; (b) Addition to carbon-hetero atom multiple bonds: Mannich reaction, acids, esters, nitrites, addition of Grignard reagents, Wittig reaction, Prinsreaction. Stereochemical aspects of addition reactions. Addition to Carbon-Hetero atom Multiplebonds: Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Mechanism of condensation reactions involving enolates –Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters. UNIT-V:Reagents and Modern Synthetic Reactions: Lithium diisopropylamine (LDA), Azobisisobutyronitrile (AIBN), Sodium cyanoborohydride (NaBH_3CN), <i>meta</i>-Chloroperbenzoic acid (m-CPBA), Dimethyl aminopyridine (DMAP), <i>n</i>-Bu_3SnD, Triethylamine (TEA), Diazobicyclo[5.4.0]undec-7-ene (DBU), Diisopropylazodicarboxylate (DIAD), Diethylazodicarboxylate (DEAD), <i>N</i>-bromosuccinimide (NBS), Trifluoroacetic acid (TFA), Tetramethyl piperidin-1-oxyl (TEMPO),
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	Phenyltrimethylammonium tribromide (PTAB), Diazomethane and Zn-Cu, Diethyl maleate (DEM), Copper diacetylacetonate ($\text{Cu}(\text{acac})_2$), TiCl_3 , NaIO_4 , Pyridinium chlorochromate (PCC), Pyridinium dichromate (PDC), Meisenheimer complex, Suzuki coupling, Heck reaction, Negishi reaction, Baylis-Hillman reaction.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE / TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J. March and M. Smith, <i>Advanced Organic Chemistry</i>, 5th ed., John-Wiley and Sons, 2001. 2. E. S. Gould, <i>Mechanism and Structure in Organic Chemistry</i>, Holt, Rinehart and Winston Inc., 1959. 3. P. S. Kalsi, <i>Stereochemistry of carbon compounds</i>, 8th edn, New Age International Publishers, 2015. 4. P. Y. Bruice, <i>Organic Chemistry</i>, 7th edn., Prentice Hall, 2013. 5. R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee <i>Organic Chemistry</i>, 7th edn., Pearson Education, 2010.
Reference Books	1. S. H. Pine, <i>Organic Chemistry</i>, 5th edn, McGraw Hill International Edition, 1987. 2. L. F. Fieser and M. Fieser, <i>Organic Chemistry</i>, Asia Publishing House, Bombay, 2000. 3. E. S. Gould, <i>Mechanism and Structure in Organic Chemistry</i>, Holt, Rinehart and Winston Inc., 1959. 4. T. L. Gilchrist, <i>Heterocyclic Chemistry</i>, Longman Press, 1989. 5. J. A. Joule and K. Mills, <i>Heterocyclic Chemistry</i>, 4th ed., John-Wiley, 2010.
Website and e-learning source	1. https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the basic principles of aromaticity of organic and heterocyclic compounds. CO2: To understand the mechanism of various types of organic reactions. CO3: To predict the suitable reagents for the conversion of selective organic compounds. CO4: To correlate the principles of substitution, elimination, and addition reactions. CO5: To design new routes to synthesis organic compounds.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

	UNIT-III:Irreversible Thermodynamics: Theories of conservation of mass and energy entropy production in open systems by heat, matter and current flow, force and flux concepts. Onsager theory-validity and verification- Onsager reciprocal relationships. Electro kinetic and thermo mechanical effects-Application of irreversible thermodynamics to biological systems.
	UNIT-IV:Kinetics of Reactions: Theories of reactions-effect of temperature on reaction rates, collision theory of reaction rates, Unimolecular reactions -Lindeman and Christiansen hypothesis- molecular beams, collision cross sections, effectiveness of collisions, Potential energy surfaces. Transition state theory-evaluation of thermodynamic parameters of activation-applications of ARRT to reactions between atoms and molecules, time and true order-kinetic parameter evaluation. Factors determine the reaction rates in solution - primary salt effect and secondary salt effect, Homogeneous catalysis- acid- base catalysis-mechanism of acid base catalyzed reactions-Bronsted catalysis law, enzyme catalysis-Michelis-Menton catalysis.
	UNIT-V:Kinetics of complex and fast reactions: Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain reactions. Chain reactions-chain length, kinetics of $H_2 - Cl_2$ & $H_2 - Br_2$ reactions (Thermal and Photochemical reactions) - Rice Herzfeld mechanism. Study of fast reactions-relaxation methods- temperature and pressure jump methods electric and magnetic field jump methods -stopped flow flash photolysis methods and pulse radiolysis. Kinetics of polymerization-free radical, cationic, anionic polymerization - Polycondensation.
Extended Professional Component	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J. Rajaram and J.C. Kuriacose, Thermodynamics for Students of Chemistry, 2nd edition, S.L.N.Chand and Co., Jalandhar, 1986. 2. I.M. Klotz and R.M. Rosenberg, Chemical thermodynamics, 6th edition, W.A.Benjamin Publishers, California, 1972.

	3. M.C. Gupta, Statistical Thermodynamics, New Age International, Pvt. Ltd., New Delhi, 1995. 4. K.J. Laidler, Chemical Kinetics, 3rd edition, Pearson, Reprint - 2013. 5. J. Rajaram and J.C. Kuriokose, Kinetics and Mechanisms of chemical transformation, Macmillan India Ltd, Reprint - 2011.
Reference Books	1. D.A. Mcqurie And J.D. Simon, Physical Chemistry - A Molecular Approach, Viva Books Pvt. Ltd., New Delhi, 1999. 2. R.P. Rastogi and R.R. Misra, Classical Thermodynamics, Vikas Publishing, Pvt. Ltd., New Delhi, 1990. 3. S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, Macmillan Publishers, New York, 1974 4. K.B. Ytsiimiriski, "Kinetic Methods of Analysis", Pergamom Press, 1996. 5. Gurdeep Raj, Phase rule, Goel Publishing House, 2011.
Website and e-learning source	1. https://nptel.ac.in/courses/104/103/104103112/ 2. https://bit.ly/3tL3GdN
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To explain the classical and statistical concepts of thermodynamics. CO2: To compare and correlate the thermodynamic concepts to study the kinetics of chemical reactions. CO3: To discuss the various thermodynamic and kinetic determination. CO4: To evaluate the thermodynamic methods for real gases and mixtures. CO5: To compare the theories of reactions rates and fast reactions.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. A. JeyaRajendran, <i>Microanalytical Techniques in Chemistry: Inorganic Qualitative Analysis</i> , United global publishers, 2021. 2. V. V. Ramanujam, <i>Inorganic Semimicro Qualitative Analysis</i> ; 3rded., The National Publishing Company, Chennai, 1974. 3. <i>Vogel's Text book of Inorganic Qualitative Analysis</i> , 4thed., ELBS, London.
Reference Books	1. G. Pass, and H. Sutcliffe, <i>Practical Inorganic Chemistry</i> ; Chapman Hall, 1965. 2. W. G. Palmer, <i>Experimental Inorganic Chemistry</i> ; Cambridge University Press, 1954.
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To identify the anions and cations present in a mixture of salts. CO2: To apply the principles of semi micro qualitative analysis to categorize acid radicals and basic radicals. CO3: To acquire the qualitative analytical skills by selecting suitable confirmatory tests and spot tests. CO4: To choose the appropriate chemical reagents for the detection of anions and cations. CO5: To synthesize coordination compounds in good quality.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	chemical classification, Mechanism of action, Treatment of diabetic mellitus. Chemistry of insulin, sulfonyl urea.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, 2. Wilson, Charles Owens: Beale, John Marlowe; Block, John H, Lipincott William, 12th edition, 2011. 3. Graham L. Patrick, An Introduction to Medicinal Chemistry, 5th edition, Oxford University Press, 2013. - Jayashree Ghosh, A textbook of Pharmaceutical Chemistry, S. Chand and Co. Ltd, 1999, 1999 edn. 4. O. Le Roy, Natural and synthetic organic medicinal compounds, E. & S. Livingstone, 1976. 5. S. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, New Delhi, 1993, New edn.
Reference Books	1. Foye's Principles of Medicinal Chemistry, Lipincott Williams, Seventh Edition, 2012 2. Burger's Medicinal Chemistry, Drug Discovery and Development, Donald J. Abraham, David P. Rotella, Alfred Burger, Academic press, 2010. 3. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale Jr and John M. Block, Wolters Kluwer, 2011, 12th edn. 4. P. Parimoo, A Textbook of Medical Chemistry, New Delhi: CBS Publishers. 1995. 5. S. Ramakrishnan, K. G. Prasanna and R. Rajan, Textbook of Medical Biochemistry, Hyderabad: Orient Longman. 3rd edition, 2001.
Website and e-learning source	1. https://www.ncbi.nlm.nih.gov/books/NBK482447/ 2. https://training.seer.cancer.gov/treatment/chemotherapy/types.html 3. https://www.classcentral.com/course/swayam-medicinal-chemistry-12908
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: Predict a drug's properties based on its structure. CO2: Describe the factors that affect its absorption, distribution, metabolism, and excretion, and hence the considerations to be made in drug design.	

CO3: Explain the relationship between drug's chemical structure and its therapeutic properties.
 CO4: Designed to give the knowledge of different theories of drug actions at molecular level.
 CO5: To identify different targets for the development of new drugs for the treatment of infectious and GIT.

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers, 2005. 2. W. L. McCabe, J.C. Smith and P. Harriott, Unit Operations of Chemical Engineering, 7th edition, McGraw-Hill, New Delhi, 2005. 3. J. M. Swan and D. St. C. Black, Organometallics in Organic Synthesis, Chapman Hall, 1974. 4. V. K. Ahluwalia and R. Aggarwal, Organic Synthesis: Special Techniques, Narosa Publishing House, New Delhi, 2001. 5. A. K. De, Environmental Chemistry, New Age Publications, 2017.
Reference Books	1. Anastas, P.T. and Warner, J.K. Oxford Green Chemistry -Theory and Practical, University Press, 1998 2. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001 3. Cann, M.C. and Connely, M.E. Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000 4. Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, American Chemical Society Washington, 2002. 5. Chandrakanta Bandyopadhyay, An Insight into Green Chemistry, Books and Allied (P) Ltd, 2019.
Website and e-learning source	2. https://www.organic-chemistry.org/ 3. https://www.studyorgo.com/summary.php
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the basic chemical techniques used in conventional industrial preparations and in green innovations. CO2: To understand the various techniques used in chemical industries and in laboratory. CO3: To compare the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources. CO4: To apply the principles of PTC, ionic liquid, microwave and ultrasonic assisted organicsynthesis. CO5: To design and synthesize new organic compounds by green methods.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /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

3 – Strong, 2 – Medium, 1 - Low

	Anticancer Agents, Chelation, therapy, Cancer treatment. Diagnostic Agents, Technetium Imaging Agents; Gadolinium MRI Imaging Agents, emperature and critical magnetic Field.
	UNIT-V: Enzymes : Introduction and properties - nomenclature and classification. Enzyme kinetics, free energy of activation and the effects of catalysis. Michelis - Menton equation - Effect of pH, temperature on enzyme reactions. Factors contributing to the efficiency of enzyme.

Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE / TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Williams, D.R. – Introduction to Bioinorganic chemistry. 2. F.M. Fiabre and D.R. Williams – The Principles of Bioinorganic Chemistry, Royal Society of Chemistry, Monograph for Teachers-31 3. K.F. Purcell and Kotz., Inorganic chemistry, WB Saunders Co., USA. 4. G.N. Mugherjea and Arabinda Das, Elements of Bioinorganic Chemistry - 1993. 5. R. Gopalan, V. Ramalingam, <i>Concise Coordination Chemistry</i> , S. Chand, 2001.
Reference Books	1. M. Satake and Y. Mido, Bioinorganic Chemistry- Discovery Publishing House, New Delhi (1996) 2. M.N. Hughes, 1982, The Inorganic Chemistry of Biological processes, II Edition, Wiley London. 3. R. W. Hay, Bio Inorganic Chemistry, Ellis Horwood, 1987. 4. R. M. Roat-Malone, Bio Inorganic Chemistry, John Wiley, 2002. 5. T. M. Loehr, Iron carriers and Iron proteins, VCH, 1989.
Website and e-learning source	1. https://www.pdfdrive.com/instant-notes-in-inorganic-chemistry-the-instant-notes-chemistry-series-d162097454.html 2. https://www.pdfdrive.com/shriver-and-atkins-inorganic-chemistry-5th-edition-d161563417.html
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: The students will be able to analyses trace elements. CO2: Students will be able to explain the biological redox systems.	

CO3: Students will gain skill in analyzing the toxicity in metals.
 CO4: Students will have experience in diagnosis.
 CO5: Learn about the nitrogen fixation and photosynthetic mechanism.

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	loss. Types of dielectric breakdown—intrinsic, thermal, discharge, electrochemical and defect breakdown.
	UNIT-IV: Special Materials: Superconductivity: Meissner effect, Critical temperature and critical magnetic Field, Type I and II superconductors, BCS theory-Cooper pair, Applications. Soft and hard magnets – Domain theory Hysteresis Loop-Applications. Magneto and giant magneto resistance. Ferro, ferri and antiferromagnetic materials-applications, magnetic parameters for recording applications. Ferro-, Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications, Non-linear optics-Second Harmonic Generators, mixing of Laser wavelengths by quartz, ruby and LiNbO ₃ .
	UNIT-V: Materials for Renewable Energy Conversion: Solar Cells: Organic, bilayer, bulk heterojunction, polymer, perovskite based. Solar energy conversion: lamellar solids and thin films, dye-sensitized photo voltaic cells, coordination compounds anchored onto semiconductor surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical activation and splitting of water, CO ₂ and N ₂ . Manganese based photo systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - photochemical generation of hydrogen from alcohol.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. S. Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications, 2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Reference Books	1.Suggested Readings 1. M.G. Arora, Solid State Chemistry, Anmol

	Publications, New Delhi, 2001. 2. R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and Company Ltd, 2001. 3.. C. Kittel, Solid State Physics, John-Wiley and sons, NY, 1966. 4. H.P. Meyers, Introductory Solid State Physics, Viva Books Private Limited, 1998. 5. A.R. West, Solid State Chemistry and Applications, John-Wiley and sons, 1987.
Website and e-learning source	1. http://xrayweb.chem.ou.edu/notes/symmetry.html . 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf . 3. https://bit.ly/3QyVg2R
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets, nanomaterials and renewable energy materials. CO2: To integrate and assess the structure of different materials and their properties. CO3: To analyse and identify new materials for energy applications. CO4: To explain the importance of crystal structures, piezoelectric and pyroelectric materials, nanomaterials, hard and soft magnets, superconductors, solar cells, electrodes, LEDs, structures and synthesis. CO5: To design and develop new materials with improved property for energy applications.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /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

3 – Strong, 2 – Medium, 1 - Low

	synthetic rubber – fertilizers – insecticides and pesticides – photo film industries – commercial aspects of starting an industry UNIT-V: Safety Signs And Colours Used In Industries – Industrial Hazards and Accidents – Classification of Hazards – Physical, chemical Biological, Ergonomic and stress Hazards – Causes, prevention and control – case study on industrial accidents – Bhopal gas Tragedy – Heat stress – sources and control – Noise pollution in industry – sources and control.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Mukhlynov (ed.), Chemical Technology, Vol.1, Mir Publication, Moscow, III edn., 1979. 2. A. K. De, Environmental Chemistry, Wiley Eastern Ltd., II edn., Meerut 1989, Chs, 5 – 7. 3. R.K. Goel, Process know-how and material of construction for Chemical Industries, S.B. Publ., Delhi, 1977. 4. B.N. Chakrabarthy, Industrial Chemistry, Oxford and IBH Publ., Now Delhi, 1984. 5. R. Norris Shreve and J.A. Brink, Jr. Chemical Process Industries, IV edn., McGraw Hill, Tokyo, 1977. 6. Industrial Safety and Environment – A.K. Gupta – University Science press, New Delhi.

SEMESTER-III

	migrations, degenerate rearrangements. Ionic sigmatropic rearrangements. Group transfer reactions. Regioselectivity, stereoselectivity and periselectivity in pericyclic reactions.
	UNIT-IV: Organic Photochemistry-I: Photochemical excitation: Experimental techniques; electronic transitions; Jablonskii diagrams; intersystem crossings; energy transfer processes; Stern Volmer equation. Reactions of electronically excited ketones; $\pi \rightarrow \pi^*$ triplets; Norrish type-I and type-II cleavage reactions; photo reductions; Paterno-Buchi reactions;
	UNIT-V: Organic Photochemistry-II: Photochemistry of α,β -unsaturated ketones; cis-trans isomerisation. Photon energy transfer reactions, Photo cycloadditions, Photochemistry of aromatic compounds; photochemical rearrangements; photo-stationary state; di- π -methane rearrangement; Reaction of conjugated cyclohexadienone to 3,4-diphenyl phenols; Barton's reactions.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. F. A. Carey and Sundberg, Advanced Organic Chemistry, 5th ed, Tata McGraw-Hill, New York, 2003. 2. J. March and M. Smith, Advanced Organic Chemistry, 5 th ed., John-Wiley and sons, 2007. 3. R. E. Ireland, Organic synthesis, Prentice Hall India, Goel publishing house, 1990. 4. Clayden, Greeves, Warren, Organic Chemistry, Oxford University Press, Second Edition, 2016. 5. M. B. Smith, Organic Synthesis 3 rd edn, McGraw Hill International Edition, 2011.
Reference Books	1. Gill and Wills, Pericyclic Reactions, Chapman Hall, London, 1974. 2. J.A. Joule, G.F. Smith, Heterocyclic Chemistry, Garden City Press, Great Britain, 2004. 3. W. Caruthers, Some Modern Methods of Organic Synthesis 4 th edn, Cambridge University Press, Cambridge, 2007. 4. H. O. House. Modern Synthetic reactions, W.A. Benjamin Inc,

	1972. 5. Jagdamba Singh and Jaya Singh, Photochemistry and Pericyclic Reactions, New Age International Publishers, New Delhi, 2012.
Website and e-learning source	1. https://rushim.ru/books/praktikum/Monson.pdf
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the basic principles of organic chemistry and to understand the various reactions of organic compounds with reaction mechanisms. CO2: To understand the versatility of various special reagents and to correlate their reactivity with various reaction conditions. CO3: To implement the synthetic strategies in the preparation of various organic compounds. CO4: To predict the suitability of reaction conditions in the preparation of tailor-made organic compounds. CO5: To design and synthesize novel organic compounds with the methodologies learnt during the course.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	method, Polarographic method and Continuous variation method (Job's method)Magnetic property of complexes: Spin-orbit coupling, effect of spin-orbit coupling on magnetic moments, quenching of orbital magnetic moments.
	UNIT-IV:Kinetics and mechanisms of substitution reactions of octahedral and square planar complexes: Inert and Labile complexes; Associative, Dissociative and SN ₁ CB mechanistic pathways for substitution reactions; acid and base hydrolysis of octahedral complexes; Classification of metal ions based on the rate of water replacement reaction and their correlation to Crystal Field Activation Energy; Substitution reactions in square planar complexes: Trans effect, theories of trans effect and applications of trans effect in synthesis of square planar compounds; Kurnakov test.
	UNIT-V:Electron Transfer reactions in octahedral complexes: Outer sphere electron transfer reactions and Marcus-Hush theory; inner sphere electron transfer reactions; nature of the bridging ligand in inner sphere electron transfer reactions.Photo-redox, photo-substitution and photo-isomerisation reactions in complexes and their applications.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic Chemistry – Principles of structure and reactivity, 4th Edition, Pearson Education Inc., 2006 2. G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, Pearson Education Inc., 2008 3. D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993. 4. B. N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd, 1976. 5. F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, Advanced Inorganic Chemistry, 6thed.; Wiley Inter-science: New York, 1988.
Reference Books	1. Keith F. Purcell and John C. Kotz, Inorganic Chemistry, Saunders Publications, USA, 1977.

	2. Peter Atkins and Tina Overton, Shriver and Atkins' Inorganic Chemistry, 5th Edition, Oxford University Press, 2010. 3. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, P. L. Guas, John Wiley, 2002, 3rd edn. 4. Concepts and Models of Inorganic Chemistry, B. Douglas, D. McDaniel, J. Alexander, John Wiley, 1994, 3rd edn. 5. Inorganic Chemistry, D. F. Shriver, P. W. Atkins, W. H. Freeman and Co, London, 2010.
Website and e-learning source	https://ocw.mit.edu/courses/5-04-principles-of-inorganic-chemistry-ii-fall-2008/pages/syllabus/
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: Understand and comprehend various theories of coordination compounds. CO2: Understand the spectroscopic and magnetic properties of coordination complexes. CO3: Explain the stability of complexes and various experimental methods to determine the stability of complexes. CO4: Predict the electronic transitions in a complex based on correlation diagrams and UV-visible spectral details. CO5: Comprehend the kinetics and mechanism of substitution reactions in octahedral and square planar complexes.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 – Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

	2. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. Viswanathan Co. Pvt., 1996. 3. V.D. Athawale and Parul Mathur, Experimental Physical Chemistry, New Age International (P) Ltd., New Delhi, 2008. 4. E.G. Lewers, Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics, 2 nd Ed., Springer, New York, 2011.
Reference Books	1. J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 2001. 2. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th edition, McGraw Hill, 2009. 3. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. Chand and Co., 1987. 4. Shailendra K Sinha, Physical Chemistry: A laboratory Manual, Narosa Publishing House Pvt, Ltd., New Delhi, 2014. 5. F. Jensen, Introduction to Computational Chemistry, 3 rd Ed., Wiley-Blackwell.
Website and e-learning source	https://web.iitd.ac.in/~nkrur/2015-16/Isem/cmp511/lab_handout_new.pdf
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the principles associated with various physical chemistry experiments. CO2: To scientifically plan and perform all the experiments. CO3: To observe and record systematically the readings in all the experiments. CO4: To calculate and process the experimentally measured values and compare with graphical data. CO5: To interpret the experimental data scientifically to improve students' efficiency for societal developments.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	UNIT-IV: Drugs containing alkaloids: Occurrence,function of alkaloids in plants, pharmaceutical applications. Isolation, Preliminary Qualitative tests and general properties. General methods of structural elucidation. Morphine, Reserpine, papaverine - chemical properties,structure and uses.
	UNIT-V: Plant Glycosides and Marine drugs: Glycosides, Basic ring system, classification, isolation, properties, qualitative analysis. Pharmacological activity of Senna glycosides, Cardiacglycosides- Digoxin, digitoxin, Steroidal saponins glycosides- Diosgenin, hecogenin. Plant pigments: Occurrence and general methods of structure determination, isolation and synthesis of quercetin and cyanidin chloride.Marine drugs -Selected Drug Molecules: Cardiovascular active substances, Cytotoxic compounds, antimicrobial compounds, antibiotic compounds, Anti-inflammatory agents. Marine toxins.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Gurdeep R Chatwal (2016), Organic chemistry of Natural products, Volume I&II, 5th edition, Himalaya publishing House. 2. S.V.Bhat, B.A. Nagasampagi, M.Sivakumar (2014), Chemistry of Natural Products, Revised edition, Narosa Publishers.
Reference Books	1. Jeffrey B. Harborne (2012), Phytochemical methods: A Guide to Modern Techniques of Plant Analysis, 4th edition, Indian reprint, Springer. 2. Ashutoshkar (2007), Pharmacognosy and Pharmacobiotechnology, 2 nd edition, New age international (P) limited, New Delhi.
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1:To recall the sources of natural medicines and analysis of crude drugs. CO2: To understand the methods of evaluation based on various parameters. CO3:To analyze the isolated drugs CO4:To apply various techniques to discover new alternative medicines. CO5:To evaluate the isolated drugs for various pharmacological activities	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

	nucleosides - direct combination, formation of heterocyclic base and nucleoside modification, conversion of nucleoside to nucleotides. Primary and secondary structure of RNA and DNA, Watson-Crick model, solid phase synthesis of oligonucleotides.
	UNIT-IV: Vitamins: Introduction, Classification, Sources and deficiency diseases. Structural determination and synthesis of Vitamin A ₁ , Vitamin B ₆ , Vitamin B ₁₂ , Folic acid, Vitamin H, Vitamin E and Vitamin K ₂ .
	UNIT-V: Fused Ring Heterocyclic Compounds: Benzofused five membered rings: Indole, isoindole, benzofuran and benzothiophene, Preparation and properties. Benzofused six membered rings: Quinoline and isoquinoline: Preparation by ring closure reactions, Reactions: Mechanism of electrophilic and nucleophilic substitutions, oxidation and reduction reactions.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	T. K Lindhorst, Essentials of Carbohydrate Chemistry and Biochemistry, Wiley VCH, North America, 2007. I. L. Finar, Organic Chemistry Vol-2, 5 th edition, Pearson Education Asia, 1975. V. K. Ahluwalia and M. Goyal, Textbook of Heterocyclic compounds, Narosa Publishing, New Delhi, 2000. M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., Jalandhar, Delhi, 2014. V. K. Ahluwalia, Steroids and Hormones, Ane books pub., New Delhi, 2009.
Reference Books	I. L. Finar, Organic Chemistry Vol-1, 6 th edition, Pearson Education Asia, 2004. Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co, 2000. Shoppe, Chemistry of the steroids, Butterworths, 1994. I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, Hyderabad, 2004. M. P. Singh. and H. Panda, Medicinal Herbs with their formulations, Daya Publishing House, Delhi, 2005.
Website and	ps://www.organic-chemistry.org/

e-learning source	ps://www.studyorgo.com/summary.php ps://www.clutchprep.com/organic-chemistry
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To understand the basic concepts of biomolecules and natural products. CO2: To integrate and assess the different methods of preparation of structurally different biomolecules and natural products. CO3: To illustrate the applications of biomolecules and their functions in the metabolism of living organisms. CO4: To analyse and rationalise the structure and synthesis of heterocyclic compounds. CO5: To develop the structure of biologically important heterocyclic compounds by different methods.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

CO /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

3 – Strong, 2 – Medium, 1 - Low

SEMESTER- IV

Title of the Course	COORDINATION CHEMISTRY – II
Paper No.	Core X

	spectroscopy in structural identification of inorganic complexes, fluxional molecules, quadrupolar nuclei- effect in NMR spectroscopy. UNIT-IV: Inorganic spectroscopy-II: Introductory terminologies: g and A parameters-definition, explanation and factors affecting g and A; Applications of ESR to coordination compounds with one and more than one unpaired electrons – hyperfine and secondary hyperfine splitting and Kramer's doublets; ESR spectra of V(II), Mn(II), Fe(II), Co(II), Ni(II), Cu(II) complexes, bis(salicylaldehyde)copper(II) and $[(\text{NH}_3)_5\text{Co}-\text{O}_2-\text{Co}(\text{NH}_3)_5]^{5+}$. Mossbauer spectroscopy – Mossbauer effect, Recoil energy, Mossbauer active nuclei, Doppler shift, Isomer shift, quadrupole splitting and magnetic interactions. Applications of Mössbauer spectra to Fe and Sn compounds. UNIT-V:Photo Electron Spectroscopy: Theory, Types, origin of fine structures - shapes of vibrational fine structures – adiabatic and vertical transitions, PES of homonuclear diatomic molecules (N₂, O₂) and heteronuclear diatomic molecules (CO, HCl) and polyatomic molecules (H₂O, CO₂, CH₄, NH₃) – evaluation of vibrational constants of the above molecules. Koopman's theorem- applications and limitations.Optical Rotatory Dispersion – Principle of CD and ORD; Δ and λ isomers in complexes, Assignment of absolute configuration using CD and ORD techniques.
Extended Professional Component	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic Chemistry – Principles of structure and reactivity, 4th Edition, Pearson Education Inc., 2006 2. G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, Pearson Education Inc., 2008 3. D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993. 4. B D Gupta and A K Elias, Basic Organometallic Chemistry: Concepts, Syntheses and Applications, University Press, 2013. 5. F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, Advanced Inorganic Chemistry, 6thed.; Wiley Inter-science: New York, 1988.

Reference Books	1. Crabtree, Robert H. The Organometallic Chemistry of the Transition Metals. 3rd ed. New York, NY: John Wiley, 2000. 2. P. Gülich, E. Bill, A. X. Trautwein, Mossbauer Spectroscopy and Transition Metal Chemistry: Fundamentals and Applications, 1st edition, Springer-Verlag Berlin Heidelberg, 2011. 3. Concepts and Models of Inorganic Chemistry, B. Douglas, D. McDaniel, J. Alexander, John Wiley, 1994, 3rd edn. 4. K. F. Purcell, J. C. Kotz, Inorganic Chemistry; Saunders: Philadelphia, 1976. 5. R. S. Drago, Physical Methods in Chemistry; Saunders: Philadelphia, 1977.
Website and e-learning source	https://archive.nptel.ac.in/courses/104/101/104101100/
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: Understand and apply 18 and 16 electron rule for organometallic compounds CO2: Understand the structure and bonding in olefin, allyl, cyclopentadienyl and carbonyl containing organometallic compounds CO3: Understand the reactions of organometallic compounds and apply them in CO4: understanding the catalytic cycles CO5: Identify / predict the structure of coordination complexes using spectroscopic tools such as IR, NMR, ESR, Mossbauer and optical rotatory dispersion studies to interpret the structure of molecules by various spectral techniques.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	PHYSICAL CHEMISTRY-II
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	determination.
	UNIT-IV: Group theory: Groups, sub groups, symmetry elements, operations, classification-axial and non-axial. Dihedral point groups- C_n, C_{nh}, D_n, D_{nh}, D_{nd}, T_d and O_h. Matrix representation and classes of symmetry operations, reducible irreducible and direct product representation. The Great orthogonality theorem – irreducible representation and reduction formula, construction of character table for C_{2v}, C_{2h}, C_{3v} and D_{2h} point groups.
	UNIT-V: Applications of quantum and group theory: Hydrogen Molecule-Molecular orbital theory and Heitler London (VB) treatment, Energy level diagram, Hydrogen molecule ion; Use of linear variation function and LCAO methods. Electronic conjugated system: Huckel method to Ethylene butadiene, cyclopropenyl, cyclobutadiene and Benzene. Applications of group theory to molecular vibrations, electronic spectra of ethylene.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE / TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. R.K. Prasad, Quantum Chemistry, New Age International Publishers, New Delhi, 2010, 4th revised edition. 2. F. A. Cotton, Chemical Applications of Group Theory, John Wiley & Sons, 2003, 2nd edition. 3. A. Vincent, Molecular Symmetry and Group Theory. A Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2nd Edition. 4. T. Engel & Philip Reid, Quantum Chemistry and Spectroscopy, Pearson, New Delhi, 2018, 4th edition. 5. G. K. Vemulapalli, Physical Chemistry, Prentice Hall of India Pvt. Ltd. 2001. 6. D.A. McQuarrie, Quantum Chemistry, Viva Books PW. Ltd, 2013, 2nd edition.
Reference Books	1. N. Levine, Quantum Chemistry, Allyn & Bacon Inc, 1983, 4th edition. 2. D.A. McQuarrie and J. D. Simon, Physical Chemistry, A Molecular Approach, Viva Books

	Pvt. Ltd, New Delhi, 2012. 3. R. P. Rastogi & V. K. Srivastava, An Introduction to Quantum Mechanics of Chemical Systems, Oxford & IBH Publishing Co., New Delhi, 1999. 4. R.L. Flurry. Jr, Symmetry Group Theory and Chemical applications, Prentice Hall. Inc, 1980 5. J. M. Hollas, Symmetry in Molecules, Chapman and Hall, London, 2011, Reprint.
Website and e-learning source	1. https://nptel.ac.in/courses/104101124 2. https://ipc.iisc.ac.in/~kls/teaching.html
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To discuss the characteristics of wave functions and symmetry functions. CO2: To classify the symmetry operation and wave equations. CO3: To apply the concept of quantum mechanics and group theory to predict the electronic structure. CO4: To specify the appropriate irreducible representations for theoretical applications. CO5: To develop skills in evaluating the energies of molecular spectra.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	INORGANIC EDTIMATIONS
Paper No.	Core Course XIII

Recommended Text	1. Vogel's Text book of Practical Organic Chemistry, 5th Ed, ELBS/Longman, England, 2003. 2. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, <i>Vogel's Textbook of Quantitative Chemical Analysis</i>; 6th ed., ELBS, 1989. 3. J. D. Woollins, <i>Inorganic Experiments</i>; VCH: Weinheim, 1995. 4. B. Viswanathan and P.S.Raghavan, <i>Practical Physical Chemistry</i>, Viva Books, New Delhi, 2009. 5. Sundaram, Krishnan, Raghavan, <i>Practical Chemistry (Part II)</i>, S. Viswanathan Co. Pvt., 1996.
Reference Books	1. N. S. Gnanapragasam and G. Ramamurthy, <i>Organic Chemistry – Labmanual</i>, S. Viswanathan Co. Pvt. Ltd, 2009. 2. J. N. Gurtu and R. Kapoor, <i>Advanced Experimental Chemistry</i>, S. Chand and Co., 2011. 3. J. B. Yadav, <i>Advanced Practical Physical Chemistry</i>, Goel Publishing House, 2001. 4. G.W. Garland, J.W. Nibler, D.P. Shoemaker, <i>Experiments in Physical Chemistry</i>, 8th edition, McGraw Hill, 2009. 5. J. N. Gurthu and R. Kapoor, <i>Advanced Experimental Chemistry</i>, S. Chand and Co., 1987.
Website and e-learning source	1. https://bit.ly/3QESF7t 2. https://bit.ly/3QANOnX
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the principles associated with various inorganic organic and physical chemistry experiments CO2: To scientifically plan and perform all the experiments CO3: To observe and record systematically the readings in all the experiments CO4: To calculate and process the experimentally measured values and compare with graphical data. CO5: To interpret the experimental data scientifically to improve students efficiency for societal developments.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Title of the Course	ANALYTICAL INSTRUMENTATION TECHNIQUE PRACTICAL(Industry Entrepreneurship)
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question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	2. Vogel's Text book of Practical Organic Chemistry, 5th Ed, ELBS/Longman, England, 2003. 2. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, <i>Vogel's Textbook of Quantitative Chemical Analysis</i> ; 6th ed., ELBS, 1989. 3. J. D. Woollins, <i>Inorganic Experiments</i> ; VCH: Weinheim, 1995. 4. B. Viswanathan and P.S.Raghavan, <i>Practical Physical Chemistry</i> , Viva Books, New Delhi, 2009. 5. Sundaram, Krishnan, Raghavan, <i>Practical Chemistry (Part II)</i> , S. Viswanathan Co. Pvt., 1996.
Reference Books	6. N. S. Gnanapragasam and G. Ramamurthy, <i>Organic Chemistry – Labmanual</i> , S. Viswanathan Co. Pvt. Ltd, 2009. 7. J. N. Gurtu and R. Kapoor, <i>Advanced Experimental Chemistry</i> , S. Chand and Co., 2011. 8. J. B. Yadav, <i>Advanced Practical Physical Chemistry</i> , Goel Publishing House, 2001. 9. G.W. Garland, J.W. Nibler, D.P. Shoemaker, <i>Experiments in Physical Chemistry</i> , 8th edition, McGraw Hill, 2009. 10. J. N. Gurthu and R. Kapoor, <i>Advanced Experimental Chemistry</i> , S. Chand and Co., 1987.
Website and e-learning source	1. https://bit.ly/3QESF7t 2. https://bit.ly/3QANOnX
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: CO1: To recall the principles associated with various inorganic organic and physical chemistry experiments CO2: To scientifically plan and perform all the experiments CO3: To observe and record systematically the readings in all the experiments CO4: To calculate and process the experimentally measured values and compare with graphical data. CO5: To interpret the experimental data scientifically to improve students efficiency for societal developments.	

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

Title of the Course	SKILL ENHANCEMENT COURSE- IV PROFESSIONAL COMPETENCY SKILL ENHANCEMENT COURSE						
Paper No.	SEC-IV						
Category	SEC	Year	I	Credits	2	Course Code	
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total		
	2		-		2		
Prerequisites	Basic concepts of Professional Competency Skill Enhancement						
Objectives of the course	To provide basic knowledge Professional Competency						
Course Outline	Professional Competency Skill Enhancement Course Training for Competitive Examinations • Chemistry for NET/UGC-CSIR/SET/ TRB Competitive Examinations(2hours) • General Studies for UPSC/TNPSC/OtherCompetitiveExaminations(2h ours) OR Chemistry for Advanced Research Studies(4hours)						

**EXTRA DISCIPLINARY COURSES FOR OTHER DEPARTMENTS
(NOT FOR MATHEMATICS STUDENTS)**

ED-II: Chemical conservation

ED-IV: Chemistry for Social studies

ED-V: Chemistry in consumer products

Title of the Course	EDC CHEMISTRY FOR FOOD PRESERVATION						
Paper No.	EDC-1						
Category	EDC	Year	I	Credits	2	Course Code	
		Semester	I				
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	3		-			3	
Prerequisites	Basic concepts of Food preservation						
Objectives of the course	To learn important methods for food preservation are to ensure the quality of processed food. To prevent Microbial contaminations To kill pathogens. To minimize food spoilage and food poisoning.						
Course Outline	UNIT-I: A. Principles of Food Preservation a. Meaning, mode of action and changes in foods B. Use of High temperature (Heat preservation) . Moist and Dry heat methods a. Blanching b. Dehydration c. Concentration d. Canning e. Commercial sterilization f. Pasteurization						
	UNIT-II: A. Use of Low Temperatures a. Cold Preservation: Freezing and Refrigeration- Air freezing b. Indirect contact freezing c. Immersion freezing d. Dehydro-freezing e. Cryo-freezing f. Changes in foods during refrigeration and frozen storage B. Use of dehydration and Concentration . Benefits and factors affecting heat and mass transfer a. Physical and chemical changes during dehydration and concentration						

	b. Methods and techniques used (Air convection, drum driers and vacuum driers) c. Use of various evaporators for concentration of foods
	UNIT-III: Use of Ionizing radiation and microwave heating - Ionizing radiations and sources - Units of radiation - Radiation effects - Mechanism of microwave heating - Application of radiation technology B. Use of Fermentation - Benefits and mechanisms of fermentation - Fermented food products e.g Beer, Wine, Soya sauce, Cheese, Soya bean products - Microbial vs Industrial Fermentation
	UNIT-IV: A. Use of Food Additives - Broad classes - Intentional and unintentional food additives - Laws and regulations B. Food Enzymes and their applications in Food industry. Application of Hurdle Technology - Fermentation
	UNIT-V: Recent advances in food preservation - Pulse electric field special packaging - Use of technology for minimal processing for preservation of fresh foods - Use of Antioxidants in food preservation - Cold pressed juices - Use of Natural Preservatives - Preservatives on food labels
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1.Borvers, J. (1992). <i>Food Theory and Application</i> (2ndEd), New York: Maxwell MacMillan International Edition. Manay, N. S. and Sharaswamy, S. M. (1997).<i>Foods: Facts and Principles</i> New Delhi: New Age International Publishers. 2.McWilliams, M (2007). <i>Foods:Experimental Perspectives</i> 5th Ed, New Jersey: Macmillar Publishing Co. Potter, N. N. and Hutchkiss, J. H. (1997).<i>Food Science</i>, 5th Ed, New Delhi: CBS Publishers and Distributors. 3.. Rick Parker (2003) <i>Introduction to Food Science</i>,

	New York: Delmar Thomson Learning. 4.Scottsmith and Hui Y.H (Editors) (2004) <i>Food Processing – Principles and Applications</i> London Blackwell Publishing. 5.Subbulakshmi, G and Udipi, S. A. (2001).<i>Foods Processing and Preservation</i>, New Delhi: New Age International (P) Ltd. Publishing. 6.Swaminathan, M. (1995).<i>Food Science Chemistry and Experimental Food</i>. The Bangalore Printing and Publishing Co. Ltd. 7.Vacklavick, V. and Christian, E. (2003).<i>Essentials of Food Science</i>.New York: Kluwer Academic/ Plenum Publisher.
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Title of the Course	EDC CHEMISTRY IN CONSUMER PRODUCTS						
Paper No.	EDC-II						
Category	EDC	Year	I	Credits	2	Course	

		Semester	I			Code	
Instructional hours per week	Lecture	Tutorial	Lab Practice			Total	
	2		-			2	
Prerequisites	Basic concepts of Consumer Products						
Objectives of the course	To provide basic knowledge in consumer products in chemistry and modern trend in Industry.						
Course Outline	UNIT-I: INORGANIC CONSUMER PRODUCTS						
	Ceramic materials – Preparation, Properties and Uses.						
	Glass- Preparation, Properties and Uses.						
	Graphite- Preparation, Properties and Uses.						
	Silica Aerogel- Preparation, Properties and Uses.						
	UNIT-II: SOAPS AND DETERGENTS						
	Saponification of oils and fats. Manufacture of soaps. Formulation of toilet soaps. Different ingredients used. Their functions. Mechanism of action of soap. ISI specifications. Testing procedures/limits.						
	Anionic detergents: Manufacture of LAB (linear alkyl benzene). Sulphonation of LAB preparation of acid slurry. Different ingredients in the formulation of detergent powders and soaps. Liquid detergents. Foam boosters. AOS (alpha olefin sulphonates. cationic detergents: examples. Manufacture and applications. Mechanism of action of detergents Comparison of soaps and detergents. Biodegradation – environmental effects. ISI specifications / limits.						
	UNIT-III: SHAMPOOS						
	Manufacture of SLS and SLES. Ingredients. Functions. Different kinds of shampoos – anti-dandruff, anti-lice, herbal and baby shampoos. Hair dye. Manufacture of conditioners. Coco betaines or coco diethanolamides – ISI specifications. Testing procedures and limits.						
	UNIT-IV: SKIN PREPARATIONS						
	Face and skin powders. Ingredients, functions. Different types. Snows and face creams. Chemical ingredients used. Anti perspirants. Sun screen preparations. UV absorbers. Skin bleaching agents. Depilatories. Turmeric and Neem preparations. Vitamin oil.						

	Nail polishes: nail polish preparation, nail polish removers. Article removers. Lipsticks, roughes, eyebrow pencils. Ingredients and functions – hazards. ISI specifications.
	UNIT-V: Leading firms, brand names, choosing the right product. Packing regulations. Marketing. Licensing – drug license – legal aspects. GMP – ISO 9000/12000 – consumer education. Evaluation of the product – advertisements.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1.Gobala Rao.S , Outlines of chemical technology, Affiliated East West press,1998 2. Kafaro, Wasteless chemical processing, Mir publishers, 1995. 3.Sawyer.W, Experimental cosmetics,Dover publishers, New york, 2000.