MOTHERTERESAWOMEN'SUNIVERSITY KODAIKANAL - 624101

DEPARTMENTOFCHEMISTRY

M.Sc.Chemistry

CurriculumFramework,Syllabus,andRegulations

(BasedonTANSCHESyllabusunderChoiceBasedCreditSystem-CBCS)

(ForthecandidatestobeadmittedfromtheAcademicYear2023-24)

SYLLABUS FRAMEWWORKFORM.Sc CHEMISTRY (AsperTANSCHEfrom2023-24)

SEMESTERI				
S.No.	**Course Code**	**CourseTitle**	**Credits**	**Hours per week**
1	P23CHT101	Core Thoery – 1: OrganicChemistry-I	5	7
2	P23CHT102	Core Theory – 2: InorganicChemistry-I	5	7
3	P23CHP103	Core Practical – 1: OrganicChemistryPractical	4	6
4	P23CHE11A/ P23CHE11B	Discipline Specific Elective – 1: A. PharmaceuticalChemistry/ B. Nanomaterialsand Nanotechnology	3	5(4L+1T)
5	P23WSG101	Generic Course - 2: WomenEmpowerment	3	5(4L+1T)
Total			**20**	**30**

SEMESTERII				
S.No	**Course Code**		**Credit**	**Hoursper Week**
1	P23CHT204	Core Theory - 3: OrganicChemistry-II	5	6
2	P23CHT205	Core Theory – 4:PhysicalChemistry-I	5	6
3	P23CHP206	Core Practical – 2:InorganicChemistryPractical	4	6
4	P23CHE22A / P23CHE22B	Discipline Specific Elective – 2: A. MedicinalChemistry/ B. MaterialChemistry	3	4
5	P23CSG202	Generic Course – 2: CyberSecurity	3	4
6	P23CHS11A / P23CHS11B	NME – Skill Enhancement Course (SEC) – 1: A. ChemistryinEverydayLife/ B. Agricultural Chemistry	2	4
Total			**22**	**30**

SEMESTERIII				
S.No	**Course Code**	**CourseTitle**	**Credits**	**Hours per week**
1	P23CHT307	Core Theory – 5: OrganicChemistry-III	5	6
2	P23CHT308	Core Theory – 6: InorganicChemistry-II	5	6
3	P23CHT309	Core Theory – 7: PhysicalChemistry-II	5	6
	P23CHP310	Core Practical – 3: Physical Chemistry Practical	4	6
4	P23CHE33A P23CHE33B	Discipline Specific Elective – 3: A. Biomolecules Heterocyclic Compounds / B. Environmental and Green Chemistry	3	3
5	P23CHN33A/ P23CHN33B	NME – 2: A. Clinical Chemistry/ B. Chemistry in Food Preservation	2	3
6	P23CHI301	Internship/Industrial Activity	2	-
Total			**26**	**30**

SEMESTERIV				
S.No	**Course Code**	**CourseTitle**	**Credit**	**Hoursper Week**
1	P23CHT411	Core Theory – 8: Inorganic Chemistry-III	5	6
2	P23CHT412	Core Theory – 9: Physical Chemistry-III	5	6
3	P23CHE44A/ P23CHE44B	Dicipline Specific Elective – 4: A. Chemistry of Natural Products and Bioinorganic Chemistry/ B. Pharmacognosy & Phytochemistry	3	4
4	P23CHPR41	Core – 10: Project with Viva	7	10
5	P23CHS402	Skill Enhancement Course (SEC) – 2: Chemistry for Advanced Research Studies	2	4
6	P23EAS401	Extension Activity	1	-
Total			**23**	**30**

1. AbouttheDepartment

The Department of Chemistry, Mother Teresa Women's University, Kodaikanal was established in 2006 and is motivated to provide a complete learning opportunity and quality education encompassing developments in frontier research areas in chemistry. We aim to strongly motivate our students for research and provide them adequate training in synthesis, characterization, application studies and instrumentationandequipstudentstomeettheglobalrequisitesforemployment.TheDepartmentoffers M. Sc., M. Phil., and Ph. D programs. The Department is specialized in research areas such asCoordination Chemistry, X-ray- crystallography, Medicinal Chemistry and Bioinorganic Chemistry.

2. AbouttheProgramme

The M. Sc. Degree Programme in Chemistry offered by Mother Teresa Women's University, Kodaikanal aims at providing advanced and in-depth knowledge in various basic and applied fields of Chemistry. The core courses equip the learners withexperimentaland analyticalskills inadditionto sound theoretical knowledge invarious aspects of Chemistry required for employability and research. The electives add additional knowledge -about applied aspects of Chemistry and implications in both Academia and industry. The non-major electives introduce integration among various inter-disciplinary courses. The skill based courses equip the learners with job and research oriented computer skills.

3. ProgrammeEducationalObjectives(PEOs))

PEO1:Toprovideasoundknowledge inChemistrywithscientific reasoningandanalytical problem solving skills

PEO2:Toinculcatescientifictemperandresearchattitudeandprovideadequatetraining in Synthesis, Characterization and Instrumentation

PEO3:Toequipthestudentswithskillsforemployability&entrepreneurship

PEO4:Toenablethe learnersto applytheknowledgeacquired infrontierareasofchemistry for new research and technology and solve the problems of the society related to Environment & health

4. Eligibility

B. Sc.ChemistrydegreewithMathematics/ Physics/ Botany/ZoologyasoneoftheAlliedsubjects

5. GeneralGuidelinesforPG Programme

a. **Duration:** The programme shall extend through a period of 4 consecutive semesters and the duration of a semester shall normally be 90 days or 450 hours. Examinations shall be conducted at the end of each semester for the respective subjects.
b. **MediumofInstruction:English**
c. **QuestionpaperpatternforExternalexaminationforCoreandElectivepapers:**
Theory Paper (Bloom's Taxonomy based)

<table>
<tr><th>IntendedLearning Skills</th><th>Maximum75Marks
PassingMinimum:50%
Duration: Three Hours</th></tr>
<tr><td rowspan="3">Memory Recall/Example/ CounterExample/Knowledge aboutthe Concepts/Understanding</td><td>Part–A(10x2=20Marks)
AnswerALLquestions
EachQuestion carries2marks</td></tr>
<tr><td>TwoquestionsfromeachUnit</td></tr>
<tr><td>Question1toQuestion10</td></tr>
<tr><td rowspan="3">Descriptions/Application (problems)</td><td>Part–B(5x5=25Marks)Answer
ALL questions
Eachquestioncarries5Marks</td></tr>
<tr><td>Either-orType
BothpartsofeachquestionfromthesameUnit</td></tr>
<tr><td>Question11(a)or11(b)
to
Question 15(a)or15(b)</td></tr>
<tr><td rowspan="3">Analysis/Synthesis/Evaluation</td><td>Part-C (3x 10 = 30 Marks)
AnsweranyTHREEquestions
Eachquestioncarries10Marks</td></tr>
<tr><td>ThereshallbeFIVEquestionscoveringallthe fiveunits</td></tr>
<tr><td>Question 16to Question20</td></tr>
</table>

- **ProjectReport**

A student should select a topic for the Project Work at the end of the third semester itself and submit the Project Report at the end of the fourth semester. The Project Report shall not exceed 75 typed pagesin Times New Roman font with 1.5-line space.

- **ProjectEvaluation**

There is a Viva Voce Examination for Project Work. The Guide and anExternal Examiner shall evaluate and conduct the Viva Voce Examination.The Project Work carries 100 marks (Internal: 25 Marks; External (Viva): 75 Marks).

6. ConversionofMarkstoGradePointsandLetterGrade(Performancein a Course/ Paper)

Rangeof Marks	GradePoints	LetterGrade	Description
90–100	9.0–10.0	O	Outstanding
80-89	8.0–8.9	D+	Excellent
75-79	7.5–7.9	D	Distinction
70-74	7.0–7.4	A+	VeryGood
60-69	6.0–6.9	A	Good
50-59	5.0–5.9	B	Average
40-49	4.0–4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

7. Attendance

Studentsmust have earned 75%ofattendance ineachcourse forappearing forthe examination. Students with 71% to 74% of attendance must apply for condonation in the Prescribed Form with prescribed fee. Studentswith65% to 70%ofattendancemustapply for condonation inthePrescribed Formwiththe prescribed fee along withthe MedicalCertificate. Students withattendance lesser than 65% are not eligible to appear for the examination and they shall re-do the course with the prior permission of the Head ofthe Department, Principal and the Registrar of the University.

8. MaternityLeave

The student who avails maternity leave may be considered to appear for theexamination with the approval of Staff i/c, Head of the Department, Controller of Examination and the Registrar.

9. AnyOtherInformation

Inadditiontothe above mentioned regulations, anyother commonregulations pertainingto the UG Programmes are also applicable for this Programme.

ProgrammeOutcomes(POs) On

completion of the Programme the learners will

1. UnderstandandappreciatetheimportanceofChemistryasacentralscienceby the knowledge of its diverse applications.
2. Havesoundknowledgeof thefundamentalandadvancedconceptsof applicationsof chemical and scientific theories.
3. Acquireexperimentalskillsrequiredforemploymentinchemicaland pharmaceutical industry.
4. Developanalyticalandproblem-solvingskills
5. Acquire the ability to synthesize, separate and characterize compounds using laboratory and instrumentation techniques.
6. Identify the major problems of the society and environment for which Chemistry has offered and can provide solutions and get motivated to further work on it by pursuing research with social responsibility.

ProgrammeSpecific Outcomes(PSOs)

OncompletionoftheM.Sc.Chemistryprogram,thestudentswillbeableto:

PSO1:Demonstratecomprehensiveknowledgeandunderstandingofboththeoreticaland experimental/appliedchemistryincludingspecializedareasofOrganic Chemistry,Inorganic Chemistry, Physical Chemistry, analytical Chemistry, Medicinal Chemistry,EnvironmentalChemistry,NanoChemistryandElectivesubjects.

PSO2:Useadvancedinstrumentsandrelatedforin-depthcharacterizationofmaterials/ ChemicalAnalysisandseparationtechnologywiththehelpoftheoreticalknowledge.

PSO3:Understandthe importanceofChemistryinsocietalandenvironmentalcontextsfor sustainable development

PSO4:Utilizetheprinciplesofscientificenquiryandanalyticalthinkingwhilesolvingproblemsand making decisions

PSO5: Open up new methods for environmental pollution & apply green/sustainable chemistryapproachtowardsplanningandexecutionofresearchinfrontierareasof chemical sciences

PSO6:Deducethestructureofcompoundsusingvariouscharacterizationtechniques

PSO7:Analyze&appreciatethedifferenttypespolymers,supramolecularmaterials, Naturallyavailablechemicalsandtheirsyntheticcongeners

PSO8:Applyappropriatetechniquesforthequalitativeandquantitativeanalysisof chemicals in laboratories

SEMESTER-I

<table>
<tr><td>Titleofthe Course</td><td colspan="7">ORGANIC CHEMISTRY</td></tr>
<tr><td>PaperNo.</td><td colspan="7">CoreI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHT101</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hoursper week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>6</td><td>1</td><td colspan="2">-</td><td colspan="3">7</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basicconceptsoforganic chemistry</td></tr>
<tr><td>Objectivesof the course</td><td colspan="7">To understand the conceptofaromaticity
Tounderstandthefeasibilityandthemechanismofvariousorganic reactions.
Tocomprehendthetechniquesinthedeterminationofreactionmechanisms.
Tounderstandtheconceptofstereochemistryinvolvedinorganic compounds.
To correlate and appreciatethe differences involved inthe varioustypes of organic reaction mechanisms.</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT-I:ReactiveIntermediatesandAromaticity
Carbocations, carbanions, carbenes, benzynes and nitrenes generation, stability and reactivity: Aromatic character: Six-, five-, seven-, and eight-membered rings - Other systems witharomatic sextets –Huckel‟s theoryofaromaticity, conceptof homoaromaticity and antiaromaticity, Electron occupancy in MO‟s and aromaticity - NMR concept of aromaticity and antiaromaticity, systems with2,4,8 and 10 electrons, systems with more than10 electrons, alternant and non-alternant hydrocarbons (azulene type).Bonding properties of systemswith(4n+2)pi-pielectronsand4npielectrons,Heteroaromatic molecules, Annulenes, heteroannulenes, syndones and fullerenes.Craig’s rule, Hammond’s postulate.</td></tr>
<tr><td colspan="7">UNIT-II: AromaticandAliphaticElectrophilic Substitution:
Aromatic electrophilic substitution: Orientation and reactivity of di- and poly substitutedphenol, nitrobenzeneandhalobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: Sulphonation; Halogen electrophiles: chlorinationandbromination;Carbonelectrophiles:Friedel-Craftsalkylation,acylation and arylation reactions. Aliphatic electrophilic substitution Mechanisms: SE2 and SEi, SE1- Mechanism and evidences.</td></tr>
</table>

	UNIT-III: **AromaticandAliphaticNucleophilicSubstitution:** Aromaticnucleophilic 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, Sommelet- Hauser and Smiles rearrangements. S_N1, ion pair, S_N2 mechanisms and evidences. Aliphatic nucleophilicsubstitutionsatanallyliccarbon, aliphatictrigonalcarbonand vinylcarbon.S_N1,S_N2,S_Ni,and$S_E1$mechanismandevidences.
	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. Configurations of allenes, spiranes, biphenyls, binaphthyls, and cyclophanic compounds, exo-cyclic, alkylidene-cycloalkanes. Topicity and prostereoisomerism. Criteria for optical purity: Resolution of racemic modifications, asymmetric transformations,asymmetricsynthesis,destruction.Stereoselectiveand stereospecificsynthesis.
	UNIT-V: Rearrangements: Rearrangements to electron deficient carbon: Pinacol-pinacolone Wagner-Meerwein, Baker-Venkataraman, Benzilic acid and Wolff rearrangements.Rearrangements to electron deficient nitrogen: Hofmann, Curtius, Schmidt, Lossen, Beckmann Rearrangements to electron deficient oxygen: Baeyer-Villiger oxidation and Dakin rearrangements. Rearrangements to electronrichatom: Favorskii, Stevens, [1,2]-Wittigand[2,3]-Wittigrearrangements.FriesandPhotoFriesrearrangement.Intramolecular rearrangements – Claisen,Cope, oxy-Cope Benzidine rearrangements.
Extended Professional Component(is a part of internal component only,Nottobe includedinthe external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothersto be solved (TobediscussedduringtheTutorial hours)
Skillsacquired from this Course	Knowledge, Problem solving, Analytical ability, Professional Competency,ProfessionalCommunicationandTransferableskills.

Recommended Text	1. J.MarchandM.Smith, AdvancedOrganicChemistry, 5th edition, John-Wiley and Sons.2001. 2. E.S.Gould, MechanismandStructureinOrganicChemistry, Holt, Rinehart and Winston Inc., 1959. 3. P.S.Kalsi,Stereochemistryofcarboncompounds,8th edition,New AgeInternationalPublishers,2015. 4. P.Y.Bruice, OrganicChemistry,7th edn,Prentice Hall, 2013. 5. J.Clayden,N.Greeves,S.Warren,OrganicCompounds,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, RSCTutorialChemistryText1,2001. 3. N.S.Isaacs,PhysicalOrganicChemistry,ELBS,Longman,UK,1987. 4. E.L.Eliel,StereochemistryofCarbonCompounds,Tata-McGraw Hill, 2000. 5. I.L.Finar,Organicchemistry,Vol-1&2,6th edition,Pearson EducationAsia,2004.
Websiteand e-learning Source	1. https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable

CLO1:To recallthebasicprinciplesoforganicchemistry.

CLO2:Tounderstandtheformationanddetectionofreactionintermediatesoforganic reactions.

CLO3:Topredictthereactionmechanismoforganicreactionsandstereochemistryof organic compounds.

CLO4:Toapplytheprinciplesofkineticandnon-kineticmethodstodeterminethe mechanism of reactions.

CLO5:To design and synthesize new organic compounds by correlating the stereochemistryof organic compounds.

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	M	S
CO2	M	S	S	S	S	M
CO3	S	S	M	S	S	S
CO4	M	S	S	S	S	M
CO5	M	S	M	S	S	M

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse ContributiontoPos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2–Medium, 1 –Low

<table>
<tr><td>Titleofthe Course</td><td colspan="7">INORGANICCHEMISTRY-I</td></tr>
<tr><td>PaperNo.</td><td colspan="7">CoreII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHT102</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>6</td><td>1</td><td colspan="3">-</td><td colspan="2">7</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicconceptsofInorganic Chemistry</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="7">Tounderstandtheconceptsof bondingandidentify thestructureand bonding of simple molecules
Togainfundamentalknowledgeonthestructuralaspectsofioniccrystals.
Tounderstandthevarioustypesofsolid-statepacking,typesofchemical forces, and defects
Togainknowledgeonthestructuralpropertiesofmaingroupcompounds and structures.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I:CovalentBonding

V.B. approach to bonding-Hitler-London, Pauling and Slater refinements, Concept of hybridization and structure of molecules, VSEPR theory shapes of molecules. M.O. approach to covalent bonding – symmetry and overlap of atomic orbitals – symmetry of molecular orbitals – sigma, pi and delta bondings – energy levels in homoandheteronucleardiatomicsystems–bondlength,bondorder andbondenergy,Applicationtosmallmoleculessuchas$BeCl_2$,BCl_3</td></tr>
</table>

	andCCl$_4$,SF$_4$,ioniccharacterinacovalentbond.Theconceptof multicentre bonding.
	UNIT-II: Solid State-Structure: Ionic crystals: Packing of ions in simple, hexagonal and cubic close packing, voids in crystal lattice, Radius ratio, Lattice energy – Born-Lande equation - Kapustinski equation, Madelung constant. Structural features of the crystal systems: Rock salt, zinc blende & wurtzite, fluorite and anti-fluorite, cadmium iodide and nickel arsenide; Spinels-normalandinversetypesandperovskitestructures-examples.
	UNIT-III:MetallicBonding andDefectsinSolids Band theory – features and its application of conductors, insulators and semiconductors, Intrinsic and extrinsic semiconductors; Superconductivity, Defects in crystals – point defects (Schottky, Frenkel,metalexcessandmetaldeficient)andtheireffectonthe electrical and optical property, laser and phosphors; Linear defects and its effects due to dislocations, Plane defects
	UNIT-IV: **StructureofMainGroupCompounds** Chemistry of boron – borane, higher boranes- structural features of closo, nido, arachano and klado; carboranes, borazines and boron nitrides. Wade's rule to predict the structure of borane cluster; main group clusters –zintl ions and mno rule. Chemistry of silicon – silanes, higher silanes, multiple bonded systems,siliconnitrides,siloxanes.P-Ncompounds, cyclophosphazenes and cyclophosphazanes. S-N compounds – S_4N_4, $(SN)_x$.
	UNIT-V: **InterhalogensandPolymericInorganicCompounds** Pseudo halogens;, Structureand bonding inClF_3, BrF_3,BrF_5 ,IF_5,IF_7etc . Isopoly and heteropoly acids – Structure and bonding of 6- and12-isopolyand heteropoly anions.Structure of silicates - applications of Paulings rule of electrovalence - isomorphous replacements in silicates – ortho, meta and pyro silicates – one dimensional, two dimensional and three-dimensional silicates – Bonding in Noble gas compounds – $XeCl_2$, XeF_4, $XeOF_4$, XeF_6.
Extended Professional Component(isa partofinternal	Questionsrelatedtotheabovetopics,fromvarious competitive examinationsUPSC/TRB/NET/ UGC-CSIR/ GATE/TNPSCothers tobesolved (TobediscussedduringtheTutorial hours)

component only, Nottobeincluded in the external examination question paper)	
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. ARWest, SolidstateChemistryand itsapplications,2ndEdition (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. Purcelland J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977. 5. J.E.Huheey,E.A.KeiterandR.L.Keiter,InorganicChemistry; 4thed.;HarperandRow:NewYork,1983.
ReferenceBooks	1. D.E.Douglas,D.H.McDanielandJ.J.Alexander,Conceptsand Models in Inorganic Chemistry, 3rd Ed, 1994. 2. RJDTilley, Understanding Solids - The Science ofMaterials, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2nd Edition, Cambridge University Press, 199. 4. T.Moeller,InorganicChemistry,AModernIntroduction;John Wiley: New York, 1982. 5. D.F.Shriver,P.W.AtkinsandC.H.Langford;Inorganic Chemistry;3rded.;OxfordUniversityPress:London,2001.
Websiteand e-learningsource	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable to

CO1:Predict thegeometryofmaingroupcompoundsandclusters.

CO2:Explainaboutthepackingofionsincrystalsandapplytheradiusratio ruleto predict the coordination number of cations.

CO3:Understandthevarioustypesofioniccrystalsystemsandanalyzetheirstructural features.

CO4:Explainthecrystalgrowthmethods.

CO5:Tounderstandtheprinciplesofdiffractiontechniquesandmicroscopictechniques.

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

3–Strong, 2–Medium, 1 –Low

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Titleofthe Course	**ORGANICCHEMISTRY PRACTICAL**						
PaperNo.	**CoreIII**						
Category	**Core**	**Year**	I	**Credits**	4	**Course Code**	P23CHP103
		Semester	I				
Instructional hoursperweek	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	1	5			6	
Prerequisites	**BasicConceptsofOrganicChemistry**						

Objectivesofthe course	Tounderstandtheconceptofseparation,qualitativeanalysisand preparation of organic compounds. Todevelopanalyticalskillinthehandlingofchemicalreagentsfor separation of binary and ternary organic mixtures. Toanalyzetheseparatedorganiccomponentssystematicallyand derivatize them suitably. Toconstructsuitableexperimentalsetupfortheorganicpreparations involvingtwostages.

	Toexperimentdifferentpurificationanddryingtechniquesforthe compoundprocessing.
Course Outline	**UNIT-I:Separationand analysis:** A. Twocomponentmixtures. B. Threecomponent mixtures.
	UNIT-II:**Estimations:(any five)** a) EstimationofPhenol(bromination) b) EstimationofAniline (bromination) c) EstimationofEthylmethylketone(iodimetry) d) EstimationofGlucose(redox) e) EstimationofAscorbicacid(iodimetry) f) EstimationofAromaticnitrogroups (reduction) g) EstimationofGlycine (acidimetry) h) EstimationofFormalin(iodimetry) i) EstimationofAcetylgroupinester(alkalimetry) j) EstimationofHydroxylgroup(acetylation) **k)** EstimationofAminogroup(acetylation)
	UNIT-III:Twostagepreparations:(anyfour) a) *p*-Bromoacetanilidefromaniline b) *p*-Nitroanilinefromacetanilide c) 1,3,5-Tribromobenzenefromaniline d) Acetylsalicyclicacidfrommethylsalicylate e) Benzilicacidfrombenzoin f) *m*-Nitroanilinefromnitrobenzene g) *m*-Nitrobenzoicacidfrommethylbenzoate

Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. ARWest,SolidstateChemistryand itsapplications,2ndEdition (Students Edition), John Wiley & Sons Ltd., 2014. 2. AKBhagiandGRChatwal, Atextbookofinorganicpolymers, Himalaya Publishing House, 2001. 3. LSmart,EMoore,SolidStateChemistry–AnIntroduction,4th Edition, CRC Press, 2012.
ReferenceBooks	1. D.E.Douglas,D.H.McDanielandJ.J.Alexander,Conceptsand ModelsinInorganic Chemistry, 3rdEd, 1994.

	2. R J D Tilley, Understanding Solids - The Science ofMaterials, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan,New Directionsin Solid StateChemistry, 2nd Edition, Cambridge University Press, 199.
Websiteand e-learningsource	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable:

CO1:Torecallthebasicprinciplesoforganicseparation,qualitativeanalysisandpreparation.

CO2:Toexplainthemethodof separationandanalysisof separatedorganicmixturesand convert them as derivatives by suitable preparation method.

CO3:Todeterminethecharacteristicsofseparationoforganiccompoundsbyvariouschemical reactions.

CO4:Todevelopstrategiestoseparate, analyzeandprepareorganic compounds.

CO5:Toformulateamethodofseparation,analysisoforganicmixturesanddesign suitable procedure for organic preparations.

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2 –Medium, 1 -Low

<table>
<tr><td>Titleofthe Course</td><td colspan="8">PHARMACEUTICALCHEMISTRY</td></tr>
<tr><td>PaperNo.</td><td colspan="8">ElectiveI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">P23CHE11A</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="3">5</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Basicknowledgeondrugsanddoses</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="8">Tounderstandtheadvancedconceptsofpharmaceuticalchemistry. To recall the principle and biological functions of various drugs.
To train the students to know the importance as well the consequences of various drugs.
To have knowledge on the various analysis and techniques.
Tofamiliarizeonthedrugdosageanditsstructuralactivities.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT-I: Physical properties in Pharmaceuticals: Physical properties of drug molecule:physical properties.Refractive index- Definition, explanation, formula, importance, determination, specific & molar refraction. Optical activity\rotation- monochromatic & polychromatic light, optical activity, angle of rotation, specific rotation examples, measurement of optical activity. Dielectric constant & Induced Polarization- Dielectricconstant explanation&determination.Rheology of pharmaceutical systems: Introduction, Definition, Applications, concept of viscosity, Newton’s law offlow, Kinematic, Relative, Specific, Reduced & Intrinsic viscosity. Newtonian system, non-Newtoniansystem-Plasticflow,Pseudoplasticflow,Dilatentflow.
Viscosity measurements- selection of viscometer for Newtonian and non-Newtonian system.</td></tr>
<tr><td></td><td colspan="8">UNIT-II:Isotopic Dilution analysis: principle andapplications,Neutron activation analysis: Principle, advantages and limitations,Scintillation counters:Body scanning.Introduction to radiopharmaceuticals.Properties of various types of radiopharmaceuticals, Radiopharmaceuticals as diagnostics, as therapeutics,forresearchandsterilization.PhysicoChemicalProperties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.</td></tr>
<tr><td></td><td colspan="8">UNIT-III: Drug dosage and product development: Introduction to drugdosageForms&Drug Delivery system – Definition of Commonterms. Drug Regulation and control,pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administrationof drugs products, need for a dosage form, classification of dosage forms. Drug dosage and product development.</td></tr>
</table>

	UNIT-IV:Development of new drugs: Introduction,procedurefollowed in drug design, theresearch for lead compounds, molecular modification of lead compounds. Structure-Activity Relationship(SAR): Factorseffecting bioactivity, resonance, inductive effect,isoterism, bioisosterism, spatial considerations,biological properties of simple functional groups,theories of drug activity, occupancy theory, ratetheory, induced-fit theory,4.3Quantitative structureactivity relationship(QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico- chemical parameters, lipophilicity parameters, electronic parameter, ionizationconstants,stericparameters,chelationparameters,redox potential,indicator-variables.
	UNIT-V:Computers in Pharmaceutical Chemistry: Need of computers for chemistry. Computers for Analytical Chemists-Introductionto computers: Organizationofcomputers, CPU, Computer memory, I/Odevices, information storage, software components. Application of computers in chemistry: Programming in high level language (C+) to handle various numerical methods in chemistry – leastsquarefit,solutiontosimultaneousequations,interpolation, Extrapolation, data smoothing, numerical differentiation andintegrations.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. PhysicalChemistry-BahlandTuli. 2. TextBookofPhysicalPharmaceutics,IIndedition,Vallabh Prakashan-.C.V.S. Subramanyam. 3. MedicinalChemistry(OrganicPharmaceuticalChemistry),G.R Chatwal, Himalaya Publishing house. 4. InstrumentalmethodofAnalysis:HubertH,Willard,7thedition. 5. TextbookofPharmaceuticalChemistryby,JayshreeGhosh,S. Chand & company Ltd.Pharmaceutical Chemistry by Dr. S. Lakshmi,Sultanchand&Sons.
ReferenceBooks	1. Computersinchemistry,K.V.Raman,TataMc.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. AnselspharmaceuticalDosageformsandDrugDeliverySystemby AllenPopvichandAnsel, Indianedition-B.I. PublicationPvt.Ltd.
Websiteand e-learningsource	https://www.ncbi.nlm.nih.gov/books/NBK482447/https://training.seer.cancer.gov/treatment/chemotherapy/types.html

CourseLearningOutcomes(forMappingwithPOsandPSOs)
Studentswillbeable:

CO1:Toidentifythesuitabledrugsfor variousdiseases.
CO2: To apply the principles of various drug action and drug design.
CO3: To acquire the knowledge onproduct development based onSAR.
CO4:Toapplytheknowledgeonapplicationsofcomputersinchemistry.
CO5:Tosynthesizenewdrugsafterunderstandingtheconcepts SAR.

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetween PSO'sandCO'sCO/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
WeightedpercentageofCourse ContributiontoPos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2 –Medium, 1 -Low

<table>
<tr><td>Titleofthe Course</td><td colspan="7">NANOMATERIALSANDNANO TECHNOLOGY</td></tr>
<tr><td>PaperNo.</td><td colspan="7">ElectiveI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHE11B</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basicknowledgeofcrystallographyandmaterialscience</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="7">Tounderstandtheconceptofnanomaterialsandnanotechnology.
To understand the various types of nano materials and their properties.
Tounderstandtheapplicationsofsyntheticallyimportant nano materials.
Tocorrelatethecharacteristics ofvariousnanomaterials synthesizedby newtechnologies.
Todesignsyntheticroutesforsyntheticallyusednewnanomaterials.</td></tr>
<tr><td rowspan="4">Course Outline</td><td colspan="7">UNIT-I: Introduction of nanomaterials and nanotechnologies, Introduction-role of size, classification-0D, 1D, 2D, 3D. Synthesis-Bottom –Up, Top–Down, consolidation of Nano powders. Features of nanostructures, Background of nanostructures. Techniques of synthesis ofnanomaterials,Toolsofthenanoscience.Applicationsof nanomaterialsandtechnologies.</td></tr>
<tr><td colspan="7">UNIT-II:Bonding and structure of the nanomaterials, Predicting the Type of Bonding in a Substance crystal structure.Metallicnanoparticles, Surfaces of Materials, Nanoparticle Size and Properties.Synthesis-Physical and chemical methods - inert gas condensation, arc discharge, laser ablation, sol-gel, solvothermal and hydrothermal-CVD-types,metalloorganic,plasmaenhanced,andlow-pressureCVD.Microwaveassistedandelectrochemicalsynthesis.</td></tr>
<tr><td colspan="7">UNIT-III:Mechanical properties of materials, theories relevant to mechanical properties.Techniques to study mechanical properties of nanomaterials,adhesionandfriction,thermalpropertiesof NanomaterialsNanoparticles: gold and silver, metal oxides: silica, iron oxide andalumina – synthesisandproperties.</td></tr>
<tr><td colspan="7">UNIT-IV:Electrical properties, Conductivity and Resistivity, ClassificationofMaterials based onConductivity, magnetic properties, electronic properties of materials. Classification of magnetic phenomena.Semiconductor materials – classification-Ge, Si, GaAs, SiC, GaN, GaP, CdS,PbS. Identification of materials as p and n –type semiconductor-Halleffect-quantumandanomalous,Hallvoltage-interpretationofchargecarrierdensity.Applicationsof</td></tr>
</table>

	semiconductors:p-njunctionastransistorsandrectifiers,photovoltaic andphotogalvanic cell.
	UNIT-V: Nanothinfilms,nanocomposites.Applicationofnanoparticlesindifferent fields.Core-shell-nanoparticles,types,synthesis,andproperties. Nanocomposites-metal-ceramic-andpolymer-matrixcomposites-applications.Characterization–SEM,TEMand AFMprinciple,instrumentationand applications.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. S.MohanandV.Arjunan,PrinciplesofMaterialsScience,MJP Publishers, 2016. 2. Arumugam,MaterialsScience,AnuradhaPublications,2007. 3. Giacavazzoet.al.,FundamentalsofCrystallography,International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson,AnIntroductiontoCrystallography,Cambridge University Press, 2012. 5. JamesF.ShackelfordandMadanapalliK.Muralidhara, Introduction toMaterialsScienceforEngineers.6th ed.,PEARSONPress,2007.
ReferenceBooks	1. S.Mohanand V.Arjunan,PrinciplesofMaterialsScience,MJP Publishers, 2016. 2. Arumugam,MaterialsScience,AnuradhaPublications,2007. 3. Giacavazzoet.al.,Fundamentalsof Crystallography,International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. JamesF. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Websiteand e-learningsource	1. http://xrayweb.chem.ou.edu/notes/symmetry.html. 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf.
CourseLearningOutcomes(forMappingwithPOsandPSOs) Studentswillbeable:	

CO1:Toexplainmethodsoffabricatingnanostructures.
CO2:Torelatetheuniquepropertiesofnanomaterialsto reducedimensionalityofthe material.
CO3:Todescribetools for propertiesofnanostructures.
CO4:To discussapplicationsofnanomaterials.
CO5:Tounderstandthe healthandsafetyrelatedto nanomaterial.

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2 –Medium, 1 -Low

SEMESTER-II

<table>
<tr><td>Titleofthe Course</td><td colspan="7">ORGANICCHEMISTRY-II</td></tr>
<tr><td>PaperNo.</td><td colspan="7">CoreIV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHT204</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per Week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicknowledgeofOrganicChemistry</td></tr>
<tr><td>Objectivesof the course</td><td colspan="7">Tounderstandtheconceptofaromaticityinbenzenoid,non-benzenoid, heterocyclic and annulene compounds.
Tounderstandthemechanisminvolvedinvarioustypesoforganic reactions with evidences.
Tounderstandthe applicationsofsyntheticallyimportantreagents.
Tocorrelatethereactivitybetweenaliphaticandaromaticcompounds. To design synthetic routes for synthetically used organic reactions.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I:Conformational analysis of acyclic and cyclic systems
Definition-restricted rotation about carbon-carbon single bonds-conformation of ethane and n-butane-conformational free energy-conformationalisomersandatrop-isomers- populationofconformers-influenceofdipole-dipolerepulsion,vanderWaals attractive force,intramolecular H-bonding on stability of conformers.
Conformational analysis of cyclohexane systems-stability and isomers in mono and di-substituted cyclohexane-flexible conformers-conformational analysis of cyclohexane and its derivatives, cyclohexanones- alkyl ketone effect-α-halo cyclohexanones-anomeric effect- Decalins-octant rule-cotton effect.</td></tr>
<tr><td></td><td colspan="7">UNIT-II Dynamic Stereochemistry-Conformation and Reactivity
Conformationandreactivityinacyclicsystems –stereo electronicand steric factors – simple examples illustrating E2 and cis eliminations, intramolecular rearrangements, WinsteinEllielEquation, Stericassistedand steric hindered reaction.Simplereactions illustrating stereoandstereo-electronic factors–esterfication,oxidation,nucleophilicsubstitutionatringcarbonsand eliminationreactions-reactionsinvolvingintramolecularrearrangements–formationandcleavageofepoxidesandneighbouringgroupparticipation– reactions of enols and enolates.</td></tr>
<tr><td></td><td colspan="7">UNIT-III:OxidationandReductionReactions: Dehydrogenationby quinones, selenium dioxides, mercuric acetate lead tetraacetate, permanganate,peroxides,peracids, osmiumtetroxide,oxidationof</td></tr>
</table>

	saturated hydrocarbons, alkyl groups, alcohols, halides and amines. Reductionoforganiccompoundswithreagentsbasedon$LiAlH_4$,$NaBH_4$, RaneyNihydrazine,formicacidanddissolvingmetals.Clemmenson reaction, Wolf Kishner reduction, Birch Reduction.
	UNIT-IV: Reagents and Modern Synthetic Reactions: Use of the followingreagentsinorganicsynthesisandfunctionalgrouptransformation– Dicyclohexylcarbodiimide, 1,3 dithiane (reactive umpolung), trimethylsilyl iodide, tri-n-butyltin hydride, Woodward and Prevost hydroxylation, DDQ Wilkinson's Catalyst – Wittig reaction.- Lithium diisopropylamine(LDA),Copperdiacetylacetonate($Cu(acac)_2$),$TiCl_3$- Suzukicoupling,Heckreaction.
	UNIT-V:AsymmetricSynthesis Importance of asymmetric synthesis – problems with resolution methods – optical purity - enantiomeric excess – diastereomeric excess – chiral, substrate controlled, auxillary controlled, catalyst controlled and solvent controlledasymmetricsynthesis,exampleforeachcase,synthesisof longifolenebyEJCoreymethod.
Extended Professional Component(is a part of internal component only,Nottobe includedinthe external examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothersto be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthis course	Knowledge,Problemsolving,Analyticalability,ProfessionalCompetency, Professional Communication and Transferable skills.
Recommended Text	1. J.MarchandM.Smith,*AdvancedOrganicChemistry*,5thed., 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*, 8thedn, New Age International Publishers,2015. 4. P.Y.Bruice,*OrganicChemistry*,7thedn.,PrenticeHall,2013. 5. R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee*OrganicChemistry*, 7th edn., Pearson Education,2010.
Reference Books	1. S. H. Pine, *Organic Chemistry*, 5thedn, McGraw Hill International Editionn,1987. 2. L.F.FieserandM.Fieser,*OrganicChemistry*,AsiaPublishing

	House,Bombay,2000. 3. E.S.Gould,*Mechanismand StructureinOrganic Chemistry*,Holt, Rinehart and Winston Inc.,1959. 4. T.L.Gilchrist, *HeterocyclicChemistry*,LongmanPress, 1989. 5. J.A.JouleandK.Mills,*HeterocyclicChemistry*,4th ed.,John-Wiley,2010.
Websiteand e-learning source	1. https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/
CourseLearningOutcomes(forMappingwithPOsandPSOs) Studentswillbeable: **CO1**:Torecallthebasicprinciplesofaromaticity oforganicandheterocycliccompounds. **CO2**:To understand themechanismofvarioustypesoforganicreactions. **CO3**:Topredictthesuitablereagentsfortheconversionofselectiveorganic compounds. **CO4**:Tocorrelatetheprinciplesofsubstitution,elimination, andadditionreactions. **CO5**:Todesignnewroutestosynthesisorganiccompounds.	

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sandCO'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
WeightedpercentageofCourse ContributiontoPos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2–Medium, 1 –Low

<table>
<tr><td>Titleofthe Course</td><td colspan="8">PHYSICALCHEMISTRY-I</td></tr>
<tr><td>PaperNo.</td><td colspan="8">CoreV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2" colspan="2">P23CHT205</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="3">6</td></tr>
<tr><td>Prerequisites</td><td colspan="8">BasicconceptsofPhysicalChemistry</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="8">To recall the fundamentals of thermodynamics and the composition of partial molar quantities.
Tounderstandtheclassicalandstatisticalapproachofthefunctions
To correlate the theories of reaction rates for the evaluation of thermodynamic parameters andstudy the mechanism and kinetics of reactions.
Togainandapplytheknowledgeontheconceptsandlawsof electrochemistry.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT-I:ThermodynamicsChemicalandPhase Equilibrium
The second law of thermodynamics – Entropy – thermodynamics of systems of variable compositions – partial molar quantities and their determination – chemicalpotential – Gibbs-Duhem equation – Activity and Fugacity- determinationof fugacity, Nernst equation,Third law of thermodynamics, exceptions and applications. Chemical equilibrium - temperature dependence, pressure, composition, Vant-Hoff equation, Non-equilibrium thermodynamics - postulates and methodology. Phase equilibrium-Applicationtothreecomponentsystem-CH_3COOH,H_2O and$CHCl_3$system.</td></tr>
<tr><td></td><td colspan="8">UNIT-II:StatisticalThermodynamicsIntroductionofstatistical thermodynamic concepts of thermodynamic and mathematical probabilities-Maxwell-Boltzmann,FermiDirac&Bose-EinsteinStatistics-applications.Partitionfunctions-evaluationoftranslational, vibrational and rotational partition functions for monoatomic, diatomic molecules.Thermodynamicfunctionsintermsofpartitionfunctions-calculation of equilibrium constants.SpecificHeatof solids-Einstein and Debye models.</td></tr>
<tr><td></td><td colspan="8">UNIT-III:KineticsofReactions
Derivation of rate constant for opposing, consecutive and parallel reaction-steady state approximation. Chain reactions: kinetics of H_2-$Cl_2$and H_2-Br_2- kinetics of decomposition of N_2O_5 – Non stationary chain reaction: H_2O_2 reaction and explosion limits. Grunwald –Winstein equationonreactionrates.ConceptofLinearFreeEnergy
Relationships-derivation of Hammett equation-significance of substituentandreactionrateconstants-Taftequation-thermodynamic</td></tr>
</table>

	implicationsofLFER.Experimentalmethodsforthestudyoffastreaction-flow method-relaxation methods.
	UNIT-IV:Electrochemistry–I Mean ion activity and activity coefficient of electrolytes in solution – Ion association - Ionic strength – Debye-Huckel theory – Debye-Huckel limiting law - its validity and limitations – Strong and weak electrolytes – Debye theory of electrolytic conductance – Debye–Huckel – Onsager equation - Verification and limitations - Electrochemicalcells andapplications ofstandardpotentials.Batteries-Primaryandsecondaryfuelcells–Corrosionandcorrosion inhibition.
	UNIT-V:Electrochemistry–II The electrical double layer – Polarizable and non-polarizable interfaces – Structure of electrical double layer – Electro capillary and double layer capacity measurements – Double layer models – Helmholtz, Guoy–Chapman and Stern models. Electro kinetic phenomena: Zeta potential – Electrophoresis Electro osmosis, sedimentation potential and streaming potential, Kinetics of electrode processes – Current–potential curve – Butler–Volmer relation and its approximations – Tafel equation – Charge transfer resistance – Nernst equation from Butler–Volmer equation – Multistepprocesses–Symmetryfactorandtransfercoefficient–Electrocatalysis–Hydrogenevolutionreactionasacase study.
Extended Professional Component(isa partofinternal componentonly, Nottobe included intheexternal Examination questionpaper)	Questionsrelatedtotheabovetopics,fromvarious competitive examinationsUPSC/TRB/NET/ UGC-CSIR/ GATE/TNPSCothers tobesolved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability, Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. J.RajaramandJ.C.Kuriacose,ThermodynamicsforStudentsof Chemistry, 2nd edition,S.L.N.Chand and Co., Jalandhar, 1986. 2. I.M.KlotzandR.M.Rosenberg,Chemicalthermodynamics,6th edition, W.A.BenjaminPublishers, California, 1972. 3. M.C.Gupta,StatisticalThermodynamics,NewAgeInternational, Pvt. Ltd., New Delhi,1995. 4. K.J.Laidler,ChemicalKinetics,3rdedition,Pearson,Reprint- 2013. 5. J.RajaramandJ.C.Kuriokose,KineticsandMechanismsof chemicaltransformation,MacmillanIndiaLtd,Reprint-2011.

ReferenceBooks	1. D.A. Mcqurrie And J.D. Simon, Physical Chemistry - A MolecularApproach,VivaBooksPvt.Ltd.,NewDelhi,1999. 2. R.P.RastogiandR.R.Misra,ClassicalThermodynamics,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,"KineticMethodsofAnalysis",Pergamom Press,1996. 5. GurdeepRaj, Phaserule,GoelPublishingHouse,2011.
Websiteand e-learningsource	1. https://nptel.ac.in/courses/104/103/104103112/ 2. https://bit.ly/3tL3GdN

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable:

CO1:To explainthe classicalandstatisticalconceptsofthermodynamics.

CO2:Tocompareandcorrelatethethermodynamicconceptstostudythekineticsof chemical reactions.

CO3: To discuss the various thermodynamic and kinetic determination.

CO4:Toevaluatethethermodynamicmethodsforrealgasesadmixtures.

CO5:To compare the theories of reactions rates and fast reactions.

POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse ContributiontoPos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2–Medium, 1 –Low

<table>
<tr><td>Titleofthe Course</td><td colspan="7">INORGANICCHEMISTRYPRACTICAL</td></tr>
<tr><td>PaperNo.</td><td colspan="7">CoreVI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHP206</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">LabPractice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>1</td><td colspan="3">5</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basicprinciplesofgravimetricandqualitativeanalysis</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="7">To understand and enhance the visual observation as an analytical tool for the quantitative estimation of ions.
Torecalltheprincipleand theoryinpreparing standard solutions.
To train the students for improving their skill in estimating the amount of ion accuratelypresent in the solution
To estimate metal ions, present in the given solution accurately without using instruments.
Todeterminetheamountofions,presentinabinarymixtureaccurately.</td></tr>
<tr><td>CourseOutline</td><td colspan="7">UNIT-I: Analysis of mixture of cations: Analysis ofa mixture of four cationscontaining two commoncationsand two rare cations. Cationsto be tested.
Group-I : W,TlandPb.
Group-II:Se,Te,Mo,Cu,BiandCd.
Group-III:Tl, Ce, Th, Zr,V,Cr,Fe, TiandU. Group-IV: Zn, Ni, Co and Mn.
Group-V:Ca,Ba andSr.
Group-VI:LiandMg.</td></tr>
<tr><td></td><td colspan="7">UNIT-II:Preparationof metal complexes:Preparation ofinorganic complexes: (any two)
a. Preparationoftristhioureacopper(I)sulphate
b. Preparationofpotassiumtrioxalatechromate(III)
c. Preparationoftetramminecopper(II) sulphate
d. PreparationofReineck’ssalt
e. Preparationofhexathioureacopper(I)chloridedihydrate
f. Preparationofcis-Potassiumtrioxalatediaquachromate(III)
g. Preparationofsodiumtrioxalatoferrate(III)
h. Preparationofhexathiourealead(II)nitrate</td></tr>
<tr><td></td><td colspan="7">UNIT-III:QuantitativeAnalysis
a) EDTAtitrations:Zn(II),Mg(II),Cu(II),andNi(II)
b) Redoxtitrations:Fe(II) vsCe(IV),Fe(II)vs dichromateNO_2^-vsCe(IV)
c) Spectrophotometricmethodsofanalysis Fe(II),Cu(II) (demonstration only)</td></tr>
</table>

	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. A.JeyaRajendran,MicroanalyticalTechniquesinChemistry: Inorganic Qualitative Analysis, United global publishers, 2021. 2. V.V.Ramanujam,*InorganicSemimicroQualitativeAnalysis*; 3rd ed.,The National Publishing Company, Chennai, 1974. 3. Vogel'sTextbookofInorganicQualitativeAnalysis,4thed.,ELBS, London.
ReferenceBooks	1. G. Pass,and H. Sutcliffe,*Practical Inorganic Chemistry*; Chapman Hall, 1965. 2. W.G.Palmer,Experimental*InorganicChemistry*;Cambridge University Press, 1954.
CourseLearningOutcomes(forMappingwithPOsandPSOs) Studentswillbeable: **CO1**:Toidentifytheanionsandcationspresentinamixtureofsalts. **CO2**: Toapply the principles of semi microqualitative analysisto categorize acid radicalsand basic radicals. **CO3**: To acquire the qualitative analytical skills by selecting suitable confirmatory tests and spot tests. **CO4**:Tochoosethe appropriatechemicalreagentsforthe detectionofanionsandcations. **CO5**:To synthesizecoordinationcompoundsingoodquality.	

Mapping(CourseArticulation Matrix)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse ContributiontoPos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2–Medium, 1 –Low

<table>
<tr><td>Titleofthe Course</td><td colspan="7">MEDICINALCHEMISTRY</td></tr>
<tr><td>PaperNo.</td><td colspan="7">Elective III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td>Credits</td><td>3</td><td>CourseCode</td><td>P23CHE22A</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hoursper week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicknowledgeofMedicinalChemistry</td></tr>
<tr><td>Objectivesof the course</td><td colspan="7">Tostudythechemistrybehindthedevelopmentofpharmaceuticalmaterials. To gain knowledge on mechanism and action of drugs.
Tounderstand theneed ofantibioticsand usageofdrugs.
Tofamiliarizewiththe modeofactionofdiabeticagentsandtreatmentofdiabetes. To identify and apply the action of various antibiotics.</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT-I:IntroductiontoReceptors:Introduction,targets,Agonist,antagonist,partial agonist.Receptors,Receptortypes,TheoriesofDrug–receptorinteraction,Drug synergism, Drug resistance, physicochemical factors influencing drug action.</td></tr>
<tr><td colspan="7">UNIT-II:Antibiotics:Introduction,Targetsofantibioticsaction,classificationof Antibiotics, enzyme-based mechanismofaction,SARofpenicllinsandtetracyclins, clinicalapplicationofpenicillins,cephalosporin.Currenttrendsinantibiotictherapy.</td></tr>
</table>

	UNIT-III:AntihypertensiveAgentsandDiuretics: Classificationofcardiovascularagents,introductiontohypertension,etiology,types, classificationofantihypertensiveagents,classificationandmechanismofactionof diuretics,Furosemide,Hydrochlorothiazide,Amiloride.
	Unit–IV:Vitamins: Classificationofvitamins,biochemicalfunctionofvitamins, Vitamins-A,B1,B2,C,EandH-SourcesandDeficiencydiseases,Recommended dietaryallowance(RDA),Structureelucidationandfunction.
	UNIT-V:Analgesics,AntipyreticsandAnti-inflammatoryDrugs: Introduction, Mechanism of inflammation, classification and mechanism of action and paracetamol,Ibuprofen,Diclofenac,naproxen,indomethacin,phenylbutazoneand meperidine.MedicinalChemistryofAntidiabeticAgentsIntroduction,Typesof diabetics,Drugsusedforthetreatment,chemicalclassification,Mechanismofaction, Treatmentofdiabeticmellitus.Chemistryofinsulin, sulfonylurea.
Extended Professional Component(is apart of internal component only,Nottobe includedinthe external examination questionpaper)	QuestionsrelatedtotheabovetopicsfromvariouscompetitiveexaminationsUPSC/ TRB/ NET/ UGC-CSIR/ GATE/TNPSCothersto be solved (TobediscussedduringtheTutorial hours)
Skillsacquired from this course	Knowledge,Problemsolving,Analyticalability,ProfessionalCompetency, Professional Communication and Transferable skills.
Recommended Text	1. WilsonandGisvold'stextbookoforganicmedicinalandpharmaceuticalchemistry, 2. Wilson,CharlesOwens:Beale,JohnMarlowe;Block,JohnH,LipincottWilliam, 12th edition, 2011. 3. GrahamL.Patrick,AnIntroductiontoMedicinalChemistry,5thedition,Oxford University Press, 2013. Jayashree Ghosh, A textbook of Pharmaceutical Chemistry,S.Chand and Co.Ltd,1999,1999 edn. 4. O.LeRoy, NaturalandSyntheticOrganicMedicinalcompounds,Ealemi,1976. 5. S.AshutoshKar,MedicinalChemistry,WileyEasternLimited, NewDelhi,1993,New edn.
Reference Books	1. Foye'sPrinclesofMedicinalChemistry,LipincottWilliams,SeventhEdition, 2012 2. Burger'sMedicinalChemistry,DrugDiscoveryandDevelopment,DonaldJ. Abraham, David P. Rotella, Alfred Burger, Academic press, 2010. 3. Wilsonand Gisvold'sTextbookofOrganic Medicinaland Pharmaceutical

	Chemistry, JohnM. BealeJrandJohnM. Block, WoltersKluwer,2011,12th edn. 4. P.Parimoo,ATextbookofMedicalChemistry,NewDelhi: CBS Publishers.1995. 5. S.Ramakrishnan, K.G.PrasannanandR.Rajan, Text bookofMedical Biochemistry,Hyderabad:Orient Longman.3rd edition,2001.
Websiteand 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

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable to:

CO1:Predictadrugspropertiesbasedonitsstructure.

CO2: Describe the factors that affect its absorption, distribution, metabolism, and excretion,and hence the considerations to be made in drug design.

CO3:Explaintherelationshipbetweendrug'schemicalstructureanditstherapeutic properties.

CO4:Explaindifferenttheoriesofdrugactionsatmolecularlevel.

CO5: Identify different targets for the development of new drugs for the treatment ofinfectious and GIT.

Mapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

3–Strong, 2 –Medium, 1 -Low

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse Contribution to Pos	3.0	3.0	3.0	3.0	3.0

<table>
<tr><td>Titleofthe Course</td><td colspan="7">MATERIALSCIENCE</td></tr>
<tr><td>PaperNo.</td><td colspan="7">Elective IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td>Credits</td><td>3</td><td>Course Code</td><td>P23CHE22B</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicknowledgeofSolid-StateChemistry</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="7">Tounderstandthecrystalstructure,growthmethodsandX-rayscattering.
Toexplaintheoptical,dielectricanddiffusionpropertiesofcrystals.
To recognize the basis of semiconductors,superconductivitymaterials and magnets.
To studythe synthesis, classification and applications of nanomaterials.
Tolearn about theimportance of materials usedfor renewable energy conversion.</td></tr>
<tr><td rowspan="4">Course Outline</td><td colspan="7">UNIT-I: Crystallography: Symmetry - unit cell and Miller indices - crystal systems - Bravais lattices - point groups and space groups - X-ray diffraction-Laue equations-Bragg's law-reciprocal lattice and its application to geometrical crystallography. Crystal structure–powder andsinglecrystalapplications.Electronchargedensitymaps,neutron diffraction-methodandapplications.</td></tr>
<tr><td colspan="7">UNIT-II: Crystal Growth Methods: Nucleation–equilibrium stability and metastable state. Single crystal –Low and high temperature,solution growth– Gel and sol-gel. Melt growth – BridgemanStockbarger,Czochralskimethods.Fluxtechnique,physical and chemical vapour transport. Lorentz and polarization factor -primary and secondary extinctions.</td></tr>
<tr><td colspan="7">UNIT-III: Properties of Crystals: Optical studies - Electromagnetic spectrum (qualitative) refractive index – reflectance – transparency, translucencyand opacity. Typesofluminescence – photo-, electro-, and injection luminescence, LEDs – organic, Inorganic and polymer LED materials - Applications. Dielectric studies- Polarisation - electronic, ionic, orientation, and space charge polarisation. Effect of temperature. dielectricconstant,dielectricloss.Typesofdielectricbreakdown– intrinsic,thermal, discharge,electrochemicalanddefectbreakdown.</td></tr>
<tr><td colspan="7">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–DomaintheoryHysteresisLoop-Applications.Magnetoand gian magneto resistance. Ferro, ferri and anti ferromagnetic materials-applications,magneticparametersforrecordingapplications.Ferro-,</td></tr>
</table>

	Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications, Non-linear optics-SecondHarmonicGenerators,mixingofLaserwavelengthsbyquartz, rubyandLiNbO$_3$.
	UNIT-V: Materials forRenewable Energy Conversion: Solar Cells: Organic,bilayer,bulkhetero junction,polymer,perovskitebased.Solar energyconversion: 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 andsplittingof water,CO2andN2.Manganesebasedphoto 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, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge,Problemsolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferableskills.
Recommended Text	1. S.MohanandV.Arjunan,PrinciplesofMaterialsScience,MJPPublishers, 2016. 2. Arumugam,MaterialsScience,AnuradhaPublications,2007. 3. Giacavazzoet.al.,FundamentalsofCrystallography,International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson,AnIntroductiontoCrystallography,CambridgeUniversity Press, 2012. 5. JamesF.ShackelfordandMadanapalliK.Muralidhara, Introduction toMaterialsScienceforEngineers.6thed.,PEARSONPress, 2007.
ReferenceBooks	1. SuggestedReadings1.M.G.Arora,SolidStateChemistry,Anmol Publications, New Delhi, 2001. 2. R.K.PuriandV.K.Babbar,SolidStatePhysics,SChandand Company Ltd, 2001. 3. C. Kittel,SolidStatePhysics,John-Wileyandsons,NY,1966. 4. H.P.Meyers,Introductory Solid- StatePhysics,VivaBooksPrivate Limited, 1998. 5. A.R. West, Solid-State Chemistry and Applications, John-Wiley and sons, 1987.
Websiteand e-learningsource	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

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable:
CO1:Tounderstandandrecallthesynthesisandcharacteristicsofcrystalstructures, semiconductors, magnets, nano materials and renewable energy materials.
CO2:Tointegrateandassessthestructureofdifferentmaterialsandtheir properties.
CO3:Toanalyseandidentifynewmaterialsforenergyapplications.
CO4: To explain the importance of crystal structures, piezoelectric and pyro electric materials, nano materials, hard and soft magnets, superconductors, solar cells, electrodes, LED uses, structures and synthesis.
CO5:Todesignanddevelopnewmaterialswithimprovedpropertyforenergyapplications.

Mapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sand 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
WeightedpercentageofCourse Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3–Strong, 2 –Medium, 1 -Low

<table>
<tr><td>Titleofthe Course</td><td colspan="8">CHEMISTRYINEVERYDAYLIFE</td></tr>
<tr><td>PaperNo.</td><td colspan="8">NME</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">NME</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">P23CHNM1A</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="3">4</td></tr>
<tr><td>Prerequisites</td><td colspan="8">BasicknowledgeinChemistry</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="8">Toenablestudentsunderstandandappreciatethechemistrybehind Dairy Industry
Toprovideknowledgeonthevariouschemicalsinfood and food adulteration
Toinculcatethebasicknowledgeofminerals,cosmeticsand cleansing agents.
Toenablestudentsgainbasicknowledgeonpetrochemicals, polymers, dyes, paints and building materials</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNITI
DairyChemistry
Generalcompositionofmilk–constituentsofmilklipids,proteins, carbohydrates,vitaminsandminerals.Physicalpropertiesofmilk– color,odour,acidity,specificgravity,viscosityandconductivity.
Factors affecting the composition of milk – pasteurization, homogenization,toning,standardization,reconstitutionofmilk-adulterationofmilk.</td></tr>
<tr><td></td><td colspan="8">UNIT-II
ChemicalsinFood
Tablesalt,sugar,bakingpowder,bakingsoda,Preservatives,artificial Sweetening agents-common examples. Nutrition: Carbohydrates, Proteins, Fats, Minerals and Vitamins-definitions, sources and their physiological importance- balanced diet. Food Adulteration: Adulterants in milk, gee, coffee, tea, asafoetida, chili powder, pulses and turmeric powder-identification. Colour chemicals used in food- soft drinks and its health hazards.</td></tr>
<tr><td></td><td colspan="8">UNIT-III: Mineral Metabolism: calcium – source, daily requirement, blood calcium, hypo calcemia, phosphorus – functions of phosphate, requirement, source, normal serum level, functions.Sodium – normal level of sodium, excretion of sodium, restriction of sodium in diet, hypernatremia.
Cosmetics:TalcumPowder,Toothpastes,Shampoos,NailPolish,</td></tr>
</table>

	Perfumes-Generalformulations–possiblehazardsofcosmeticsuse **Cleansingagents:** Soapsanddetergents,cleansingaction,bleachingandstainremoval
	UNIT-IV:.ChemistryandIndustry-I ChemicalsinFoodProduction: Fertilizerssuchasurea,NPKandSuperphosphates -usesand hazards Pesticides –definitionandexamplesFertilizersfromnaturalsources Petrochemicals: Generationsandcompositionofpetrochemicals,Rocketpropellants Polymers and Plastics: Polythene,polyester,PVC,bakelite,resins;Teflonandnylon -their applications Biodegradablepolymersand Biopolymers
	UNIT-V:ChemistryandIndustry-II Dyes,Paintsand Pigments: Composition,ClassificationandApplications;Processofdying. Building Materials: Cementanditsmanufacture,Mortar,ConcreteandR.C.CManufacture of glass, Ceramics Rubber:NaturalRubber-Syntheticrubbers-Vulcanization-definition and its applications
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge.
Recommended Text	1. CarlHSnyder**,TheExtraordinaryChemistryofEveryday Things**, 4th edition 2003 2. AlfredVivian,EverydayChemistry,HardpressPublishing, 2012 3. JohnEmsleyChemistryatHome:ExploringtheIngredientsin

	EverydayProducts, RoyalSocietyofChemistry;Illustrated edition, 2015
ReferenceBooks	1. KirpalSingh,ChemistryinDailyLife:PHI,3rd Ed.,2010 2. H-D.Belitz,WernerGrosch,PeterSchieberle,FoodChemistry,Springer; 4th revised and extended Ed., 2009
Websiteand e-learningsource	

CourseLearningOutcomes(forMappingwithPOsandPSOs)

Studentswillbeable:

CO1: Appreciate the centralrole of chemistry in our society (K5)

CO2:ComprehendtheroleofchemicalsinFood&Nutrition(K1) **CO3**: Realize the role of chemistry in food production.(K4)

CO4:Understandandanalyzetheroleofchemistryinpetrochemical,polymer, andcosmetic Industry (K4)

Mapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

LevelofCorrelationbetweenPSO'sand 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
Weightedpercentageof Course ContributiontoPos	3.0	3.0	3.0	3.0	3.0

Titleofthe Course	**AGRICULTURALCHEMISTRY**
PaperNo.	**SE-1**

<table>
<tr><td>Category</td><td>NME</td><td>Year</td><td>I</td><td>Credits</td><td>2</td><td>Course Code</td><td>P23CHNM1B</td></tr>
<tr><td></td><td></td><td>Semester</td><td>II</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>3</td><td>1</td><td colspan="3">-</td><td>4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicknowledgeinChemistry</td></tr>
<tr><td>Objectivesofthe course</td><td colspan="7">Toenablestudentsunderstandthechemicalcompositionofsoil
Toprovideknowledgeonthechemistrybehindfertilizers
Toenablestudentsknowandunderstandthechemistrybehind pesticides
Toenablestudentsanalyzeandfindasuitablemethodtopromote agriculture.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNITI
Soil Chemistry
Soil analysis. composition of soil: organic and inorganic constituents. Soil acidity : buffering capacity of soils. Absorption of cations and anions: availability of soil nutrients to plants</td></tr>
<tr><td></td><td colspan="7">UNIT-II
Fertilizers
Difference between fertilizer and manure – Superiority of manure over fertilizers, Peat and organic manures (composts). Role of humus. Effluent form gobar gas plants. Use of fertilizers: urea, DAP, Super phosphate, Gypsum, NPK-mixed fertilizers, Optimal addition of fertilizers to obtain estimated yields.</td></tr>
<tr><td></td><td colspan="7">UNIT-III:Pesticides,Fungicides,HerbicidesAndWeedicides

Pesticides: Classification on the basis of mode of action, types of pests and Chemical nature with examples – safety measures while using pesticides. 2.4 Fungicides, Herbicides, Acaricides, Rodenticides, Repellants, Fumigants, Defoliants (Definitions and Examples).</td></tr>
<tr><td></td><td colspan="7">UNIT-IV:.PlantGrowthRegulators
3-Indole acetic acid, naphthalene acetic acid, Ethepon (2-chloroethyl phosphoric acid): Alar (succinin acid-2, 2-dimethyhydrzine :) their function. Plant hormones: Gibberlin, Cyclocel, Phosphon, dwarfing compound (CCC: 2-Chlorethyltrimethyl ammonium chloride). Defoliants</td></tr>
</table>

	Unit-V:Insecticids Basic and newer formulations of insecticides, contact insecticides, fumigants, manufacture and uses of insecticides. DDT, BHC, pyrethrin mention of aldrin, dieldrin, endrin and pentachlorophenol Handling hazards ofinsecticides – Symptoms ofpoisoning, first aid and antidotes.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skills acquired fromthiscourse	Knowledge.
Recommended Text	1. Joseph Scudder Chamberlain Organic Agricultural Chemistry (the Chemistry of Plants and Animals); A Textbook of General AgriculturalChemistryorElementaryBio-Chemistryfor Usein Colleges, Andesite Press, 2015 2. H.ParameshwarHegde,TextbookofAgro-Chemistry, Discovery PublishingPvt. Ltd, 2009
ReferenceBooks	1. G.T. Austin: Shreve's Chemical Process Industries, 5th edition, Mc-Graw-Hill,1984 2.B.A.Yagodin(Ed).AgriculturalChemistry,2Volumes,Mir Publishers (Moscow), 1976
Websiteand e-learningsource	

CourseLearningOutcomes(forMappingwithPOsandPSOs)
Studentswill:
CO1: Have Acquired knowledge on the chemical composition of soil (K1)
CO2: Be able to illustrate the chemistrybehind fertilizers and pesticides (K4)
CO3: Be able to appreciate the chemistry behind agricultural methods (K5)
CO4:Beabletofindandsuggestsuitablemethodstopromoteagriculture.(K6)

CO-POMapping(CourseArticulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	M	S
CO2	M	S	S	S	S	M
CO3	S	S	M	S	S	S
CO4	M	S	S	S	S	M
CO5	M	S	M	S	S	M

3–Strong, 2 –Medium, 1 –Low

SEMESTER-III

<table>
<tr><td>Titleofthe Course</td><td colspan="7">ORGANIC CHEMISTRY-III</td></tr>
<tr><td>PaperNo.</td><td colspan="7">CoreI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td>P23CHT307</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hoursper week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>6</td><td>1</td><td colspan="3">-</td><td colspan="2">7</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicconceptsofOrganic Chemistry</td></tr>
<tr><td>Objectivesof the course</td><td colspan="7">To provide understanding of the basic concepts of photochemistry and various organic photochemical reactions.
To provide understanding of the pericyclic reactions.
To enable the student to analyze organic compounds using various spectroscopic techniques.
To enable the students to apply the knowledge gained in the above concepts</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="7">UNIT-I: Organic Photochemistry
Thermal versus photochemical reactions, basic concepts of organic photochemistry, Jablonski diagram – energy transfer mechanism – photochemical reactions of saturated ketones – Norrish type I and II reactions – photoreduction – Paterno - Buchi reaction – reaction of α, β unsaturated ketones – isomerisations – photochemistry of simple olefins – cis-trans isomerisation – di-π methane rearrangement – photochemical oxidations – oxidative coupling – photochemistry of arenes.</td></tr>
<tr><td colspan="7">UNIT-II: Pericyclic reactions
Definition of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – selection rules and stereochemistry for thermal and photochemical reactions – explanation on the basis of (i) FMO approach (Fukui), (ii) orbital correlation diagram approach (Woodward and Hoffmann) and (iii) aromatic transition state approach (Dewar and Zimmerman) Taking simple systems as example. Diels-Alder reaction, ene reaction, Sommelet – Hauser, Cope and Claisen rearrangements.</td></tr>
<tr><td colspan="7">UNIT-III: Application of UV, IR and Mass Spectrometry in organic chemistry
UV spectra – types of excitation or transition probability – chromophores and auxochromes – factors affecting intensity and position of absorption bands – Dienes, Polyenes and Enones – Woodward Fischer rules.
IR Spectra – Hooke’s law – factors affecting vibrational frequencies – characteristic group frequencies – Finger print region.
Mass spectrometry – basic principles – molecular ion peak, parent peak, fragments, metastable peak, isotope peaks – determination of molecular weight and molecular fragment – fragment pattern of simple organic molecules – Mc lafforty rearrangement.</td></tr>
</table>

	Unit IV: Applications of NMR spectroscopy ^{1}H NMR spectroscopy – origin of NMR spectra – chemical shift – number of signals – peak areas – multiplicity – geminal, vicinal and long range couplings – factors affecting chemical shifts and coupling constants, Karplus equation, AX, AX_3, AB_2, ACMX PATTERNS first order spectra, Simplification of complex spectra. ^{13}C NMR spectroscopy: Broadband and Off resonance decoupling, comparison of ^{1}H and ^{13}C NMR – factors affecting intensity of signals – chemical shifts - γ - gauche effect 2D Techniques: ^{1}H-^{1}H COSY ,^{1}H-^{13}C COSY .
	Unit V: Organic Synthesis Importance of synthesis – carbon-carbon bond making reactions – functional group modifications – reterosynthetic analysis – synthons and synthetic equivalents – nucleophilic, electrophilic, electroneutral and free radical synthons – umpolung – protection and deprotection – product, chemo, regio and stereoselectivities. One and two group disconnections – Diels Alder reactions –Robinson annulation method – 1,2- 1,3- 1,4- 1,5- and 1,6- difunctional compounds
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge.

Text Books	1. J.D. Coyle, Organic Photochemistry, Wiley, 1985. 2. J.M. Coxon, B. Halton, Organic Photochemistry, 2nd Ed., Camb. Univ. Press, 1987. 3. G.R. Chatwal, Organic Phtochemistry, 1st Ed., Himalaya Publications house, 1998. 4. J. Clayden, N. Greeves, S. Warren, P. Wothers, Organic Chemistry, 1st Ed., Oxford University Press; 2000. 5. C.H.Depuy and D.L.Chapman, Molecular Reactions and Photochemistry, Prentice Hall, 1975. 6. T.L.Gilchrist and R.C.Storr, Organic Reactions and Orbital Symmetry, 2ndEdn., Cambridge, 1972. 7. R.E.Lehr and A.P.Marchand, Orbital Symmetry, A problem solving approach, Academic Press, New York, 1972. 8. A.L.Bellamy, An introduction to conservation of orbital symmetry, Longmann, 1975. 9. S.M.Muherjee and S.P.Singh, Pericyclic Reactions, Macmillan, 1976.
ReferenceBooks	1.P.M. Silverstein, F.X. Wester, Spectroscopic Identification of Organic Compounds, 6th Ed., Wiley 1998. 2. J. Mohan, Organic Spectroscopy Principles and Applications, 2nd Ed., CRC, 2004. 3. W. Kemp, Organic Spectroscopy, 3rd Ed., MacMillon, 1994. 4. D.L. Pavia, G.M. Lampman, G.S. Kriz,Introduction to Spectroscopy,3rd Ed., Brooks Cole, 2000. 5. R.T. Morrison and R.N. Boyd, Organic Chemistry, 6th Ed., Pearson, 1992.
Course Outcomes	1. Understand the basic concepts of photochemistry and various organic photochemical reactions 2. Understand pericyclic reactions 3. Apply NMR, IR, MS, UV-Vis spectroscopic techniques in solving structure of organic molecules and in determination of their stereochemistry.

PO/ PSO	P O1	P O2	P O3	P O4	PO 5	PO 6	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8
CO1	S	S	S	S	S	M	M	M	S	M	M	M	M	M
CO2	S	S	S	S	S	M	M	M	S	M	M	M	M	M
CO3	S	S	S	S	S	M	M	M	S	M	M	M	M	M
CO4	S	S	S	S	S	M	M	M	S	M	M	M	M	M

Titleofthe Course	**INORGANIC CHEMISTRY – II**						
PaperNo.	**CoreI**						
Category	**Core**	**Year**	I	**Credits**	5	**Course Code**	P23CHT308
		Semester	III				
Instructional hoursper week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	6	1	-			7	
Prerequisites	BasicConceptsofInorganic Chemistry						
Objectivesof the course	To familiarize the bonding concepts and isomerism in coordination compounds. To provide thorough understanding of the electronic spectra and reaction mechanisms of coordination compounds. To enable the student, understand and appreciate the structure and bonding in organometallic compounds and pi- acceptor complexes. To enable the students to apply the knowledge gained in the above concepts.						
Course Outline	**Unit I:Chemistry of Coordination Compounds** Brief review of the general characteristics of transition elements, nomenclature of coordination complexes, Isomerism in coordination compounds, types of ligands and chelate effect, stepwise and overall formation constants-determination of stability constant by Job's continuous variation method., VB theory and CFT - Splitting of d-orbitals under different geometries – CFSE – factors affecting CFSE – spectrochemical series – Jahn-Teller distortion- application of d-orbital splitting to explain magnetic properties, Limitations of CFT – MO theory – sigma – and pi-bonding in complexes – Nephelauxetic effect						

	Unit II: Electronic Spectra of Metal Complexes Term symbols for atoms and ions – splitting of orbitals and terms in crystal fields – characteristics of d-d transitions – energy levels – Orgel and Tanabe – Sugano diagram, calculation of 10Dq and β for Co(II) (O_h and T_d) and Ni(II) (O_h) complexes- charge transfer spectra of bipyridine and related diimine systems ORD and CD: Chirality and the special nomenclature of chiral coordination compounds - optical activity, ORD and CD – Cotton effect – absolute configurations of chiral coordination compounds
	UNIT-III: **Inorganic Reaction Mechanism** Electron transfer reactions: Outer-sphere and inner sphere electron transfer reactions – The Marcus theory – non-complementary reactions – synthesis of coordination compounds by electron transfer reactions. Substitution reactions, Trans Effect, substitution reactions of square planar complexes of Pt(II) and other d^8 metal complexes – significance of trans-effect – substitution reactions of octahedral complexes – acid and base hydrolysis reactions – anation reactions, the template effect and macrocyclic ligands.
	Unit IV: Organometallics The 18 electron rule – applications and limitations – Isolobal concept and its usefulness, Hapticity, Metal alkyl and aryls – olefin and acetylene complexes – Zeise salt – Dewar-Chatt approach to bonding in olefins & cyclobutadiene complexes, cyclopentadiene and benzene complexes of transition metals (preparation, bonding and reactions), – Fluxional molecules. Homogeneous catalysis involving organometallics – oxidative addition and reductive elimination reactions – hydrogenation, isomerization and hydroformylation of olefins – carbonylation of methanol, oxidation of olefins (Wacker process) - heterogeneous catalysis – Ziegler-Natta polymerization of propylene.
	Unit V: Pi-acceptor Complexes Synthesis, structure and bonding of mono nuclear and poly-nuclear carbonyls – nitrosyl complexes – dinitrogen complexes – metal carbonylato complexes, carbonyl hydrides and complex metal cyanides.

Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpa per)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skillsacquired fromthiscourse	Knowledge.
Text Books	1. J.D. Lee, Concise Inorganic Chemistry, 5th Ed, Wiley, 1999. 2. J.E. Huheey, Inorganic Chemistry, 3rd. Ed., Harper & Row publisher, 1983 3. D.F. Shriver, P.W. Atkins, Inorganic Chemistry, 3rd Ed, 1999
Reference Books	1. D.E. Douglas, D.H. McDaniel, J.J. Alexander, Concepts and Models in Inorganic Chemistry, 3rd Ed. 1994. 2. F.A. Cotton, G. Wilkinson, Advanced Inorganic Chemistry, 4th Ed., John Wiley & Sons,1986 3. S.F.A. Kettle, Physical Inorganic Chemistry – A Coordination Chemistry Approach, Oxford University Press, 1996. 4. A.G. Sharpe, Inorganic Chemistry, Pearson Education, 2008. 5. P. Powell, Principles of Organometallic Chemistry, 2nd Edn., ELBS, 1991. 6. F. Basolo, R.G. Pearson, Mechanism of Inorganic Reactions, 2nd Ed., John Wiley, 1967. 7. N. N. Greenwood, A. Earnshaw, Chemistry of the Elements, 2nd Edn., BH, 1997. 8. M. F. Purcell, J. C. Kotz, Inorganic Chemistry, Saunder, 1977.
Course Outcomes	On learning the course, the students will be able to 1. Identify the bonding, structure and reactivity of selected coordination complexes 2. Interpret their electronic spectra and magnetic properties. 3. Utilize the principles of transition metal coordination complexes in understanding functions of biological systems. 4. Understand the bonding , structure and applications of organometallic compounds

	9. Oxford Chemistry Primers Series, No.12, M. Bochmann,Organometallics1: Complexes with transition metal-carbon σ bonds and No. 13 M. Bochmann,Organometallics 2: Complexes with transition metal-carbon π-bonds. 10. J.P. Collman, L.S. Hegedus, J.R. Nortan, R.G. Finke, Principles and Applications of Organotransition Metal Chemistry, University Science Books, 1980. 11. R. Hoffmann, Angew. Chem. Int. Ed., Engl. 21, 711-800, 1982.

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	S	M	S	M	S	S	S	M	M	M	M	M	M
CO2	S	S	M	S	M	S	S	S	M	M	M	M	M	M
CO3	S	S	M	S	M	S	S	S	M	M	M	M	M	M
CO4	S	S	M	S	M	S	S	S	M	M	M	M	M	M

Titleofthe Course	**PHYSICALCHEMISTRY-II**						
PaperNo.	**CoreV**						
Category	**Core**	**Year**	I	**Credits**	5	**Course Code**	P23CHT309
		Semester	III				
Instructional hoursperweek	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	5	1	-			6	
Prerequisites	**BasicconceptsofPhysicalChemistry**						

Objectivesof the course	To provide a sound knowledge and understanding of the quantum chemical laws and their applications To enable the students to understand and appreciate the importance of the reactions in surface and catalysis To enable the students to appreciate the importance green chemistry and polymer chemistry To enable the students to apply the knowledge gained in the above concepts.
Course Outline	**UNIT-I:Quantum Theory – I** Planck's quantum theory – Bohr atom model - Wave – Particle duality – Uncertainty Principle – Operators and commutation relations – Sums and product of operator, commutator, linear and non-linear operator, Hermitian and Hamiltonian operator, Postulates of quantum mechanics and Schrodinger equation – eigen functions and eigen value, - Free particle – Particle in a box – degeneracy-one and three-dimensional, distortion of the box and Jahn-Teller effect, quantum numbers, zero-point energy, orthogonalisation and normalityfinite potential barrier – tunneling.
	UNIT-II:Quantum Theory – II Derivation of angular momentum operator, Rigid rotator-Harmonic oscillator. The hydrogen atom – space quantization of electronic orbits – angular and radial part, electron spin - Approximate methods of solving the Schrodinger equation – The perturbation and variation methods – Application to He atom - Angular momentum–spin orbit interaction – vector model of the atom – term symbols – Pauli's Exclusion principle Slater determinant. Atomic Structure Calculation
	UNIT-III:**Quantum Theory – III** Molecular Orbital and valence bond theory of molecules: The Born–Oppenheimer approximation, MO treatment of H_2^+, and MO and VB treatment of H_2 molecule – comparison of MO and VB methods. Bonding in homo and hetero nuclear diatomics (HF, CO, NO) – polyatomic molecules, concept of hybridization -Huckel theory of conjugated systems - application to ethylene, butadiene.

	Unit IV: Surface Chemistry and Catalysis Surface Phenomena: Physisorption and chemisorptions ,solid- liquid interfaces – contact angle and wetting, Adsorption from solution, , Gibbs adsorption isotherm — solid-gas interface — Freundlich, Langmuir, Temkin, BET isotherms – surface area determination. Homogeneous catalysis – Acid-base catalysis – Acidity function – Enzyme catalysis – Michaelis–Menten kinetics. Kinetics of bimolecular surface reactions involving adsorbed species – Langmuir-Hinshelwood mechanism, Langmuir – Rideal mechanism – Rideal –Eley mechanism. Basic aspects of semiconductor catalysis and applications Solar energy conversion – Photogalvanic cell – Photoelectrochemical cells – Electrolysis of water.
	UNIT-V:**Polymer Chemistry** Overview of polymers – Structure and classification of polymers – Degree of polymerization, Kinetics and mechanism of free radical and ionic polymerizations - Coordination polymerization, Zeigler–Natta catalysis Condensation – Self catalysed and Non-catalyzed polycondensation, Copolymerization – Co-polymer - Equation and significance, Molecular weight of polymers– Determination of molecular weight – Light scattering and viscosity methods - Gel permeation chromatography. Stereoregularity of polymers- significance of T_g and T_m
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)

Skills acquired fromthiscourse	Knowledge.
Text Books	1. A.K. Chandra, Introductory Quantum Chemistry, 4th Ed,. Tata McGraw Hill, 2009. 2. I.N. Levine, Quantum Chemistry, Allyn and Bacon, 1983 3. P.W. Atkins, Molecular Quantum Mechanics, 2nd Edn, Oxford Univ. Press, 1987 4. F.W. Billmeyer, Jr., A Text Book of Polymer Science, John Wiley, 1971. 5. V.R. Gowariker, N.V. Viswanathan, J. Sreedhar, Polymer Science, New Age Publishers, 1986. 6. P.W. Atkins,Physical Chemistry, 7th Ed., Oxford University press, 2002. 7. S. Glasstone, Text book of Physical Chemistry, McMillan, 1974.
Reference Books	1. D.A. McQuarrie, D. Simon, Physical chemistry, A Molecular Approach, Viva Books Pvt. Ltd, 2003. 2. D.A. Mcquarrie, Quantum Chemistry, University Science Books, 1998. 3. F.L. Pillar Elementary Quantum Chemistry, McGraw Hill, 1968. 4. J.P. Lowe and K.A.Peterson, Quantum Chemistry, 3rdEdn., Elsevier 2006. 5. A.W. Adamson, Physical Chemistry of Surfaces, 4th Ed., John Wiley, 1982. 6. B.M.W. Trapnell, Chemisorption, Academic Press, 1955. 7. P.J. Flory, Principles of Polymer Chemistry, Cornell University Press, 1971. 8. A. Tager, Physical Chemistry of Polymers, Mir Publishers, 1978.
Course Outcomes	On learning the course, the students will be able to 1. Solve the model problems in quantum mechanics and analyze the basis behind the postulatory method of quantum mechanics 2. Apply time independent perturbation theory to complex problems of molecular energy levels 3. Appreciate and apply the principles of green chemistry and polymer chemistry 4. Understand and appreciate the importance of the reactions in surface and catalysis

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	S	M	S	M	M	M	M	M	M	M	M	M	M
CO2	S	S	M	S	M	M	M	M	M	M	M	M	M	M
CO3	S	S	M	S	M	S	M	M	M	S	S	M	S	M
CO4	S	S	M	S	M	M	S	M	M	S	M	M	M	M

Titleofthe Course	**PHYSICAL CHEMISTRY PRACTICALS**						
PaperNo.	**CoreVI**						
Category	**Core**	**Year**	I	**Credits**	4	**Course Code**	P23CHP310
		Semester	III				
Instructional hoursperweek	**Lecture**	**Tutorial**	**LabPractice**			**Total**	
	-	1	5			6	
Prerequisites	**Basicprinciplesofgravimetricandqualitativeanalysis**						
Objectivesofthe course	To develop skill in carrying out kinetics experiments To develop skill in carrying out experiments related to distribution law and study phase diagrams. To impart skill in analysis through conductometry. To develop skill analysis through potentiometry						

	15.Conductometry - Displacement titrations. 16. Conductometry – Determination of dissociation constant of weak acids. 17. Conductometry – Solubility product of sparingly soluble silver salts. 18. Verification of Onsager equation – conductivity method. 19. Determination of degree of hydrolysis and hydrolysis constant of a substance. 20. Potentiometric titrations – Acid alkali titrations. 21. Potentiometric titrations – Precipitation titration. 22. Potentiometric titrations – Redox Titrations. 23. Potentiometry – Determination of dissociation constant of week acids. 24. Potentiometry- Determination of solubility product and pKa
Text Books	1. B.P. Levitt, Ed., Findlay`s practical Physical Chemistry, 9th Ed., Longman, 1985. 2. J.N. Gurtu, R. Kapoor, Advanced Experimental Chemistry, Vol.I, S.Chand & Co., 1987.
Reference Books	1. B. Viswanathan and P. S. Raghavan, Practical Physical Chemistry, Viva Books,2009.
Course Outcomes	On learning the course, the students will be able to • Explain the principle behind the experiments • Plan and Perform experiments • Interpret experimental results • Perform estimation through conductometry and potentiometry

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO2	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO3	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO4	S	S	S	S	M	M	M	M	S	M	M	S	M	M

Prerequisites	Basic knowledge of Biomolecules and Heterocyclic Compounds
Objectives of thecourse	To learn the basic concept and biological importance of biomolecules and natural products. To explain various of functions of carbohydrates, proteins, nucleic acids, steroids and hormones. To understand the functions of alkaloids and terpenoids To elucidate the structure determination of biomolecules and natural products. To extract and construct the structure of new alkaloids and terpenoids from different methods.
Course Outline	**UNIT-I: Chemistry and Metabolism of Carbohydrates** Definition, classification and biological role of carbohydrates, monosaccharides: Linear and ring structures (Haworth formula) of ribose, glucose, fructose and mannose (Structure determination not required), physical and chemical properties of glucose and fructose. Disachharides: Ring structures (Haworth formula)-occurrence, physical and chemical properties of maltose, lactose and sucrose. Polysaccharides: starch, glycogen and cellulose- structure and properties, glycolysis of carbohydrates.
	UNIT-II: Steroids and Hormones Steroids-Introduction, occurrence, nomenclature, configuration of substituents. Diel's hydrocarbon, stereochemistry, classification. Biological importance, colour reactions of sterols, cholesterol-occurrence, tests, physiological activity, biosynthesis of cholesterol-occurrence, tests, physiological activity, biosynthesis of cholesterol from squalene. Hormones-Introduction, classification, functions of sex-hormones

	Androgens and estrogens, adrenocortical hormones-cortisol and cortisol structure and functions of non-steroidal hormones-adrenaline and thyroxin.
	UNIT-III: Proteins Separation and purification of proteins-dialysis, gel filtration and electrophoresis, catabolism of aminoacids-transamination, oxidative amination and decarboxylation. Biosynthesis of proteins
	UNIT-IV: Nucleic acids Aminoacid metabolism and urea cycle, structure, methods for the synthesis of nucleosides-direct combination, formation of heterocyclic base and nucleoside modification, conversion of nucleoside to nucleotides. Primary and secondary structure of RNA and DNA, Waston-Crick model, solid phase synthesis of oligonucleotides.
	UNIT V:Fused Ring Heterocyclic Compounds Benzo fused five member rings: Indole, isoindole, benzofuran and benzothiophene, preparation and properties. Benzofused six membered rings: Quinoline and isoquinoline: Preparation by ring closure reactions, Reactions: Mechanism of electrophiic and nucleophiic substitutions, oxidation and reduction reactions.
Extended Professional Component (is apart of internal component only,Not to be included in the external examination question paper)	Questions related to the above topics, from various competitiveexaminationsUPSC/TRB/NET/UGC-CSIR/GATE/TNPSCotherstobe solved (To be discussed during theTutorial hours)

Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency,Professional Communication and Transferable skills.
Text Books	1. T.KLindhorst,Essentials of Carbohydrate Chemistry and Biochemistry, Wiley VCH, North America,2007. 2. I.L.Finar,OrganicChemistryVol-2,5edition,Pearson Education Asia,1975. 3. V.K.Ahluwalia and M.Goyal, Textbook of Heterocyclic compounds,Narosa Publishing, New Delhi, 2000. 4. M.K.Jainand S.C. Sharma, Modern Organic Chemistry,Vishal Publishing Co., Jalandhar, Delhi, 2014. 5. V.K.Ahluwalia,Steroids and Hormones, Ane books pub.,NewDelhi, 2009.
Reference Books	1. I.L.Finar,OrganicChemistryVol1,6th edition,PearsonEducat ionAsia,2004. 2. Pelletier, Chemistry of Alkaloids,Van NostrandReinholdCo,2000. 3. Shoppe,Chemistryofthesteroids,Butterworthes,1994. 4. I.A.Khan,andA.Khanum.RoleofBiotechnologyinmedicinal& aromaticplants,Vol1andVol10,UkkazPublications,Hyderaba d,2004. 5. M.P.SinghandH.Panda,MedicinalHerbswiththeirformulations, DayaPublishingHouse, Delhi,2005.
Websiteand e-learningsource	https://www.organic-chemistry.org/ https://www.studyorgo.com/summary.php https://www.clutchprep.com/organic-chemistry
CourseLearning Outcomes(forMapping with Posand PSOs)	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 inn the metabolism of living organism. CO4:To analyse and rationalize the structure and synthesis of heterocyclic compounds. CO5:To develop structure of biologically important heterocyclic compounds by different methods.

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO2	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO3	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO4	S	S	S	S	M	M	M	M	S	M	M	S	M	M

Titleofthe Course	**Environmental Chemistry and Green Chemistry**						
PaperNo.	**ElectiveV**						
Category	**Elective**	**Year**	I	**Credits**	3	**Course Code**	P23CHE33B
		Semester	III				
Instructional hoursperweek	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	4	1	-		5		
Prerequisites	BasicknowledgeonEnvironmental Chemistry						
Objectivesofthe course	To provide knowledge and understanding of the various types and ways to eradicate pollution. To familiarize the various methods of water treatment. To enable the students to appreciate the concepts of green chemistry. To impart concern over the environment and insist to adopt eco-friendly methods						
Course Outline	**UNIT-I: Water Pollution** Types of water pollution,-Physical, chemical and biological types, ground water and surface water pollution – sources and harmful effects – sources and effects of major water pollutants –inorganic pollutants – oxygen demanding wastes - organic pollutants – plant nutrients – detergents – radioactive wastes – nuclear pollution – sources effects of ionizing and non-ionizing radiation. Significance of various water pollutants- thermal pollution						

	UNIT-II : Air Pollution Atmosphere-structure – functions and photochemical reactions – sources of air pollution- natural and man made –acid rain, classification and effects of air pollutants – CO, CO_2, SO_2, SO_3,NO and NO_2 – hydrocarbon as pollutant – reactions of hydrocarbons and effects – particulate pollutants – sources and effects of Organic particulate and Inorganic particulate Green House effect – impact on global climate – role of CFC's – ozone holes – effects of ozone depletion – smog-components of photochemical smog-effects of photochemcial smog.
	UNIT-III: Pesticides and Soil Pollution Soil Pollution: Sources, Types, Pesticides – classification, mode of action – toxic effects of chlorinated hydro carbons, organophosphorous compounds and carbamates – alternatives to chemical pesticides – (pheromones, Juvenile harmones, chemosterilization)
	UNIT-IV: **Treatment of drinking water** Removal of suspended impurities, removal of micro-organisms, Treatment of Efflunets, 1º treatment,- Filteration, Coagulation, - 2º treatment –oxidation ponds- 3º treatment-reverse osmosis, electrodialysis- Nanofilteration. Treatment of water for Industrial purpose- Hardness-softening methods-Zeolite-Limo-soda-Ion Exchange methods.
	UNIT-V: Green Chemistry Green Chemistry - Definition, principles and requirements, water mediated reactions - solventless reactions – microwave assisted reactions – solid supported reactions – uses of ionic liquids and supercritical carbondioxide reaction in organized media – uses of calixarene, zeolites, cyclodextrin and other supramolecules as media for selection reactions - clay catalysed reactions – definitions and examples of multicomponents reaction and tandem reactions – atom economy reactions.

Extended Professional	Questions related to the above topics, from various competitiveexaminationsUPSC/TRB/NET/UGC-

Component (is apart of internal component only,Not to be included in the external examination question paper)	CSIR/GATE/TNPSCotherstobe solved (To be discussed during theTutorial hours)
Skills acquired fromthiscourse	Knowledge.
Text Books	1. Asim K.Das, Environmental Chemistry with Green Chemistry, Books & Allied (P) Ltd, Kolkata, 2012. 2. B.K.Sharma, Environmental Chemistry, Goel Publishers, 2001.
Reference books	1. A.K. De, Environmental Chemistry, New Age International, Fifth Edition, 2005. 2. C. J. Gonzalez, D. J. C. Constable, Green Chemistry and Engineering, A practical Design approach, Wiley Interscience, 2011 3. S. Parsons, B. Jefferson, Introduction to potable water treatment processes, Wiley –Blackwell, 2006.
Course Outcomes	On learning the course, the students will be able to 1. Identify environmental problems related to pollution 2. Identify and utilize eco-friendly methods to protect environment 3. Understand and apply green chemical methods 4. Solve the problems related to environmental pollution

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	M	M	M	M	S	M	M	M	M	S	M	M	M
CO2	S	M	M	M	M	S	M	M	M	M	S	M	M	M
CO3	S	M	M	M	M	S	M	M	M	M	S	M	M	M
CO4	S	M	M	M	M	S	M	M	M	M	S	M	M	M

<table>
<tr><td>Title of theCourse</td><td colspan="7">CLINICAL CHEMISTRY</td></tr>
<tr><td>PaperNo.</td><td colspan="7">NME-2</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHS2A</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructionalhoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">LabPractice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge of Chemistry</td></tr>
<tr><td>Objectives of thecourse</td><td colspan="7">To understand the basics of human organ functions and to impart knowledge on clinical biochemistry and laboratory practices.
To describe the basic anatomy of human body
To interpret laboratory results of blood and urine samples
To Measure total cholesterol, serum LDL and blood glucose level</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I: Basics of Human Metabolism
Basics of Human Organ Functions - Plasma proteins in disease - Liver function and disease - Carbohydrate metabolism and its disorders - Disorders of detoxification and excretory mechanisms – renal function, Acid base disorders, Electrolyte and water Balance.

UNIT-II: Laboratory Techniques
Introduction to Clinical Laboratories - Laboratory Work Flow cycle - Phlebotomy equipments -Identification of Blood Collection Tubes &Preparation of Blood Plasma and Serum, , Liver Function Tests - Measurement of Serum ALT &AST, Liver Function Tests.

UNIT- III - Renal Function
Renal Function Tests, Measurement of Serum BUN -Renal Function Tests -Measurement of Serum Creatinine Clearance -lipid Profile, - Routine Urine Analysis & Identification of Normal Physical and Chemical Urine Constituents.

Unit- IV - Urine Analysis
Identification of Pathological Physical and Chemical Urine Constituents & Microscopic examination of Urine, Quantitative Determination of Urine Protein Proteinuria & Micro albuminuria Quantitative Determination of Urine Uric Acid Quantitative Determination of Urine Creatinine</td></tr>
</table>

	UNIT-V:**Blood Analysis** Measurement of Serum Total cholesterol, Measurement of Serum LDL-C, Measurement of Serum HDL-C, Measurement of Serum TG, Diabetic Profile Tests Measurement of Blood Glucose.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skills acquired fromthiscourse	Knowledge.
Text Books	1. R. Chawla, Practical Clinical Biochemistry: Methods and Interpretations, 3rd Edn., Medical Publishers, New Delhi, 2003. 2. B. Mohanty and S. Basu, B. I, Fundamentals of Practical Clinical Biochemistry,. publishers, New Delhi, 2006.
Reference books	1. Michael L. Bishop, Edward P.Fody, and Larry E. Schoeff, Clinical Chemistry: Principles, Techniques, Correlations, 8th Edition, 2017. 2. D. White, N. Lawson, P. Masters and D. Mc Laughlin, Clinical Chemistry, Garland Science, 2016.
Course outcomes	Students will able to To understand the basics of human organ functions and to impart knowledge on clinical biochemistry and laboratory practices. To describe the basic anatomy of human body To interpret laboratory results of blood and urine samples To Measure total cholesterol, serum LDL and blood glucose level

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO2	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO3	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO4	S	S	S	S	M	M	M	M	S	M	M	S	M	M

<table>
<tr><td>Title of the Course</td><td colspan="7">CHEMISTRY IN FOOD PRESERVATION</td></tr>
<tr><td>Paper No.</td><td colspan="7">NME-2</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHS2B</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge of Food Preservation</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To appreciate the changes in their properties on processing.
To enable the students to understand the storage, preservation and processing
To enable the students to understand the chemical components in food stuffs & the importance of fruits and vegetables</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I: FOOD PRESERVATION:
Principles of Food Preservation A) Meaning, mode of action and changes in foods
B. Use of High temperature (Heat preservation) a) Moist and Dry heat methods b) Blanching c) Dehydration d) Concentration e) Canning f) Commercial sterilization g) Pasteurization
C. 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 D.</td></tr>
<tr><td></td><td colspan="7">UNIT-II: TRADITIONAL METHODS OF FOOD PRESERVATION:
Smoking, Sun drying, Pickling/ Salting, Fermentation- Recent advances in food preservation a) Pulse electric field special packaging b) Use of technology for minimal processing for preservation of fresh foods.</td></tr>
<tr><td></td><td colspan="7">UNIT- III: COLORANTS:
Pigments in animals and plants tissues- myoglobin, oxymyoglobin, metmyoglobin - color of meat, color change on processing - pigment stability on packaging- technology of color preservation - enzymic - metallo complex formation; carotenoids-occurrence-distribution. Betalains–structure–stability-effects of pH, heat and light.</td></tr>
<tr><td></td><td colspan="7">UNIT-IV: PRESERVATIVES AND ANTIOXIDANTS:
Additives–contaminants–role of additives-intentional additives Preservatives–benzoic acid–parabens–citric acid–sorbic acid–sulphites-nitrites– nitrates–hydrogen peroxide- Use of Natural Preservatives Antioxidants: Generation–causes–effects–Naturally occurring antioxidants-role of Vitamin C– Vitamin E –tocoferols–lipoic acid–evaluation of antioxidant property.</td></tr>
</table>

	UNIT-V: FRUITS AND VEGETABLES PROCESSING: Storage, preservation and packaging of fruits and vegetables. Ripening – natural and artificial ripening of fruits Processing operation – trimming, washing, blanching, packaging and freezing. Manufacture of fruit juice – canning, pickling – dehydration.
--Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)
Skills acquired fromthiscourse	Knowledge.
Text Books	1. R.Fennema, Food chemistry, Marcel and Decker Inc, 3rd edition,1996. 2. J.M. de Man, Principle of food chemistry, Aspen Publishing Inc, 1999. 3. F.D. Vargas, O.P. Copez, Natural colourants for food and neutraceutical uses, CRC Press New York, 2003. 4. S.Sadasivam and A. Manikkam, Bio-chemistry methods - New Age International Pvt Ltd 2nd edition, 1996.
Reference books	1. Anti-oxidants in food-practical application, Edt: Pokorny, Nedgalka Yanishliva & Michael Gordon, CRC Press New York, 2001. 2. Food flavour technology, Sheffield academic press, Edt: Andrew J.Taylor, CRC Press NewYork, 2002. 3. L.H. Meyer, Food chemistry, CBS Publishers and Distributors, New Delhi, 2000. 4. Shakuntala Manay and Shadaksharaswamy, Food, fact and principles, New Age International Publishers, New Delhi, 2001.
Course outcomes	On completion of this course, the students will be able to 1. Explain the various methods of Food Preservation 2. Appreciate the importance of traditional methods of Food Preservation. 3. Analyze to importance of using safe preservatives. 4. Explain the methods of fruits and vegetables processing.

Mapping of Cos with POs &PSOs:

PO/ PSO	PO1	PO2	PO 3	PO4	PO5	PO6	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	PS O8
CO1	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO2	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO3	S	S	S	S	M	M	M	M	S	M	M	S	M	M
CO4	S	S	S	S	M	M	M	M	S	M	M	S	M	M

<table>
<tr><td>Titleofthe Course</td><td colspan="7">INORGANIC CHEMISTRY – III</td></tr>
<tr><td>PaperNo.</td><td colspan="7">CoreI</td></tr>
<tr><td>Category</td><td>Core</td><td>Year
Semester</td><td>I
IV</td><td>Credits</td><td>5</td><td>Course Code</td><td>P23CHT411</td></tr>
<tr><td>Instructional hoursper week</td><td>Lecture
6</td><td>Tutorial
1</td><td colspan="3">Lab Practice
-</td><td>Total
7</td></tr>
<tr><td>Prerequisites</td><td colspan="7">BasicConceptsof Inorganic Chemistry</td></tr>
<tr><td>Objectivesof the course</td><td colspan="7">To enable the students to analyze the inorganic compounds using various spectroscopic techniques.
To appreciate and understand the importance of nuclear reaction
To familiarize the important inorganic photochemical reactions.
To enable the students to apply the knowledge gained in the above concepts.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Unit I: Infrared Spectroscopy

Spectroscopy in the structural elucidation of simple molecules like N_2O, ClF_3, NO_3^-, ClO^-_4 – uses of groups vibrations in the structural elucidation of metal complexes of urea, thiourea, cyanide, thiocyanate, nitrate, sulphate and dimethyl sulfoxide</td></tr>
<tr><td></td><td colspan="7">Unit II: NMR Spectroscopy
Examples for different spin systems – chemical shifts and coupling constants (spin-spin coupling) involving different nuclei (^1H, ^{19}F, ^{31}P, ^{13}C) interpretation and applications to inorganic compounds- NMR spectra of P_4S_3,H_3PO_3,H_3PO_2 and HPF_2. ^{19}F NMR spectra of ClF_3, BrF_3 and equimolar mixture of TiF_6 and TiF_4 in ethanol – Effect of quadrupolar nuclei on the ^1H NMR spectra, Satellite spectra.
Systems with chemical exchange - study of fluxional behavior of molecules NMR of paramagnetic molecules – isotropic shifts contact and pseudo-contact interactions – Lanthanide shift reagents.</td></tr>
</table>

0	**Unit III-EPR Spectroscopy** Theory of EPR spectroscopy - Spin densities and McConnell relationship –presentation of the spectrum-hyperfine splitting, Applications of ESR to some simple systems such as CH_3, *p*-benzosemiquinone, Xe_2^+ - Factors affecting the magnitude of g and A tensors in metal species - Zero-field splitting and Kramers degeneracy – Spectra of VO(II), Mn(II), Co(II) and Cu(II) complexes **Mossbauer Spectroscopy** Theory-Doppler effect - isomer shift-quadruple splitting-magnetic hyperfine splitting-application of MB spectroscopy to inorganic compounds
	UNIT-IV: Nuclear Chemistry Properties of nucleus – different types of nuclear forces – liquid drop model, shell model of nucleus – nuclear reactions induced by charged particles – Q value – nuclear reaction cross section, significance and determination – theory of nuclear fission – reactor and its components – production of feed materials for nuclear reactors – disposal of radioactive wastes – nuclear fusion, stellar energy. Application of radioisotopes in agriculture, industry and medicine – neutron activation analysis – hot atom chemistry.
	Unit-V: Inorganic Photochemistry Elementary ideas on the photosystems I and II - Photochemistry of Cr(III), Co(III) and Ru(II) - coordination compounds – photoaquation – photoanation – photoisomerisation – photo redox reactions – charge transfer photo chemistry – photosensitization – solar energy conversiuon – photogalvanic cell – splitting of water to evolve hydrogen and oxygen – photochemistry of Pt(II) complexes.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)

Skills acquired fromthiscourse	Knowledge.
Text Books	1. R.S. Drago, Physical Methods in Inorganic Chemistry, 3rd Ed., Wiley Eastern Company 2. K.K. Rohatgi-Mukherjee, Fundamentals of Photochemistry, Tata-McGraw Hill, 1981. 3. E.A.V. Ebsworth, Structural Methods in Inorganic Chemistry, 3rd Ed., ELBS, 1987.
Reference Books	1. R.S. Drago, Physical Methods in Chemistry, W. B. Saunders Company, 1992. 2. J. Lewis, R.G. Wilkins, Modern Coordination Chemistry, Inter Science publisher, 1960. 2. K.K. Rohatgi-Mukherjee, Fundamentals of Photochemistry, Tata-McGraw Hill, 1981. 3. Collected readings in Inorganic photochemistry, J. Chem. Edn. 1983. 4. G. J. Ferraudi, Inorganic photochemistry, 1973. 5. A.W. Adamson, E.D. Fleishcer, Concepts in Inorganic photochemistry, 1963.
Course Outcomes	On learning the course, the students will be able to 1. Analyze inorganic compounds using various spectroscopic techniques. **2.** Understand the principles and applications of nuclear reactions **3.** Familiarize the important inorganic photochemical reactions. 4. Apply the knowledge gained in the above concepts.

Mapping of Cos with POs &PSOs:

PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8
CO 1	S	S	M	S	M	S	S	S	S	M	M	M	M	M
CO 2	S	S	M	S	M	S	S	S	M	M	M	M	M	M
CO 3	S	S	M	S	M	S	S	S	M	M	S	M	M	M
CO 4	S	S	M	S	M	S	S	S	M	M	M	M	M	M

<table>
<tr><td>Titleofthe Course</td><td colspan="8">PHYSICALCHEMISTRY-III</td></tr>
<tr><td>PaperNo.</td><td colspan="8">CoreV</td></tr>
<tr><td>Category</td><td>Core</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td colspan="2">P23CHT412</td></tr>
<tr><td></td><td></td><td>Semester</td><td>III</td><td colspan="4"></td></tr>
<tr><td>Instructional hoursperweek</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="8">BasicConceptsofPhysicalChemistry</td></tr>
<tr><td>Objectives of the courses</td><td colspan="8">To provide a sound knowledge and understanding of the concepts and applications of group theory.
To familiarize the theories behind various spectroscopic techniques
To provide knowledge and understanding of statistical thermodynamics and its applications.
To enable the students to apply the knowledge gained in the above concepts.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT-I: Group Theory: Concepts

Elements of symmetry – point group classification of molecules – definition and theorems of group – properties of group with examples - symmetry operations as elements of group – group multiplication table – similarity transformations – sub groups – classes – representation of groups - reducible and irreducible representations – Great orthogonality theorem (derivation and proof excluded) – character table for H_2O and NH_3 molecules – format and significance – direct products and simplified procedure for generating and factoring total representations. Symmetry adapted linear combinations – projection operators.</td></tr>
<tr><td></td><td colspan="8">UNIT-II: Group theory : Applications

Molecular vibrations and their symmetry types in typical molecules – IR and Raman activity – bonding with central atom and formation of hybrid atomic orbitals in molecules such a BF_3– simplification of MO calculations – naphthalene, benzene – symmetries of molecular orbitals and electronic configurations – group theoretical selection rules – vanishing matrix elements selection rules for electronic transitions – electronic spectra of the carbonyl chromophore.</td></tr>
</table>

	UNIT-III- Spectroscopy – I General features of spectrum – Experimental techniques – Intensities of spectral lines and linewidths - Rotational spectra - Vibrational spectra – Rotation–Vibration spectra of diatomic and polyatomic molecules – Fermi resonance – Basic concepts of FTIR – Raman spectroscopy – Rotational Raman and vibrational Raman – Resonance Raman and Laser Raman – Electronic spectra of diatomic molecules – Franck-Condon principle – Vibrational and rotational fine structure – Fortrat diagram – Predissociation.
	Unit-IV Spectroscopy-II NMR -Nuclear spins in a magnetic field-Zeeman effect-Larmor precession-Resonance Phenomenon-Spin -lattice and spin-spin relaxation times-Nuclear shielding and chemical shift-spin spin coupling-Basic principles of FT NMR-Inversion recovery and CPMG sequenced for T1 and T2 measurements-NMR instrumentation. .
	Unit-V: Photochemistry Absorption of light by molecules, reaction paths of electronically excited molecules-de - excitation pathways. Fluorescence and phosphorescence-Jablanski diagram- Physical properties of the electronic excited molecules-excited state dipole moments, excited state pKa and redox potentials-Stern -Volmer equation and its application-photosensitization-Chem Luminescence-Quantum Yield.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)

Skills acquired fromthiscourse	Knowledge.
Text Books	1. 1. F.A. Cotton, Chemical Applications of group Theory, 3rd Ed., Wiley Eastern, 2004. 2. R.L. Carter, Molecular Symmetry and Group Theory John Wiley, 1998. 3. C.N. Banwell, E. McCash, Fundamentals of molecular Spectroscopy, 4th Ed., TMH, 2008. 4. B.P. Straughan, S.Walker Spectroscopy Vol.3, Chapman Hall, 1976. 5. G.M. Barrow, Introduction to Molecular Spectroscopy, McGraw Hill, 1964. 6. P.K. Ghosh, Introduction to Photoelectron Spectroscopy, John Wiley, 1989. 7. P.W. Atkins, Physical Chemistry, 7th Ed., Oxford University press, 2002.
Reference Books	1. 1 R.L. Flurry, Jr, Symmetry Groups – Prentice Hall, New Jersy 1980. 2. B.E. Douglas and C.A. Hollingsworth, Symmetry in Bonding and Spectra – An Introduction, Academic Press, 1985. 3. S.F.A. Kettle, Symmetry and Structure, John Wiley & Sons, 1985 4. D.A. McQuarrie, D. Simon, Physical chemistry, A Molecular Approach, Viva Books Pvt. Ltd, 2003.
Course Outcomes	On learning the course, the students will be able to 1. Determine the symmetry operations of any small and medium-sized molecule and apply point group theory to the study of hybridization and spectroscopy. 2. Have a sound knowledge of the theories behind various spectroscopic techniques 3. Apply the concepts of statistical thermodynamics for the study of equilibrium reactions. 4. Understand to apply the concepts of statistical thermodynamics for the study of reaction rates.

Mapping of Cos with POs &PSOs:

PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8
CO 1	S	S	M	S	M	M	M	M	M	M	M	M	M	M
CO 2	S	S	M	S	M	M	M	M	S	M	M	M	M	M
CO 3	S	S	M	S	M	M	M	M	M	S	M	M	M	M
CO 4	S	S	M	S	M	M	M	M	M	S	M	M	M	M

Titleofthe Course	**Chemistry of Natural Products and Bioinorganic Chemistry**						
PaperNo.	**ElectiveVI**						
Category	**Elective**	**Year**	I	**Credits**	3	**Course Code**	P23CHE44A
		Semester	IV				
Instructional hoursperweek	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	**BasicknowledgeonNatural Products**						
Objectivesofthe course	To enable the students to understand thestructure of organic natural products. To provide knowledge of the structures of metalloproteins and metalloenzymes. To familiarize the importance of natural product and bio-inorganic compounds. To enable the students to know and appreciate the importance of chemistry of nature.						
Course Outline	**UNIT-I: Proteins, peptides, Nucleic acid** Structure and properties of amino acids and proteins. Nucleic acids – nucleotides and nucleosides – structure of purine and pyrimidine bases; bond, double helical structure of DNA. Structure of RNA (tRNA)						

	UNIT-II-Terpenoids Classification of terpenoids with examples – isoprene rules – General methods of structural determination of terpenes – structure and synthesis of *alpha*-pinene, cadinene, zingeberene and abietic acid.
	UNIT-III: Alkaloids General methods of structure analysis of alkaloids – Hoffmann, Emde and von Braun degradations – Structure and synthesis of quinine, papavarine, and lysergic acid.
	UNIT-IV: Steroids Types of steroids – structure, stereochemistry and synthesis of cholesterol – Structural features of bile acids – Sex harmones – androsterone, testerosterone, progesterone - Structure of ergosterol.
	UNIT-V: Bioinorganic Chemistry Metal ions in biological systems: heme proteins, hemoglobin, myoglobin, hemerythrin, hemocyanin; Iron-sulphur proteins: rubredoxin, ferredoxin.Copper proteins - Electron transfer (Cu, Zn) – Blue copper proteins Metalloenzymes: active sites, carboxy peptidase, carbonic anhydrase, superoxide dimutase; photosynthesis, nitrogen fixation, nitrogenase; ion pump,.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examination questionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)

Skills acquired fromthiscourse	Knowledge.
Text Books	**1.** I.L. Finar, Organic Chemistry, Vol.II, ELBS 1985 2. S.J. Lippard, J.M. Berg, Principles of Bioinorganic Chemistry, Panima Publishing Company, 1977. 3. Gurdeep R Chatwal,Organic Chemistry Of Natural Products, Volume I , Himalaya Publishing House, 2009 4. L. Stryer, Biochemistry, 4th Ed., W. L. Freeman and Co, New York, 1995. 5. D. L. Nelson, M. M. Cox, Lehninger Principles of Biochemistry, 5th Ed.
Reference Books	1. W. Kaim, B. Schewederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, John Wiley & Sons, 1994. 2. Bioinorganic Chemistry, Chem. Education, 62, No. 11, 1985. 3. G.L. Eichorn, Inorganic Biochemistry, Volumes 1 & 2, 2nd Ed., Elsevier, 1973. 4. J.N.Davidson, The Biochemistry of Nucleic acids, ELBS, 1965. 5. J.L.Simonsen, The Terpenes, Vols 1-4, Academic Press, N.Y. , 1957. 6. K.Nakanishi, Natual Products Chemistry, Vols. I & II, Academic Press, 1975. 7. W.Klyne, The Chemistry of Steriods, Methuen and co., N.Y. 1965. 8. Androsterone and Testosterone: *J. Chem. Soc. Perkin Trans. I*, **1986**, 117-123. 9. Estrone, Estradiol and 2-Methoxyestradiol:*J. Org. Chem.***2009**, *74*, 6362-6364.
Course Outcomes	On learning the course, the students will be able to 1. Understand the structure of organic natural products. **2.** Identify the structures of metalloproteins and metalloenzymes. **3.** Appreciate the importance of natural products and bio-inorganic compounds. **4.** Know and appreciate the importance of chemistry of nature.

Mapping of Cos with POs &PSOs:

PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8
CO 1	S	M	M	M	M	S	S	S	M	M	M	M	M	S
CO 2	S	M	M	M	M	S	S	S	M	M	M	M	M	S
CO 3	S	M	M	M	M	S	S	S	M	M	M	M	M	S
CO 4	S	M	M	M	M	S	S	S	M	M	M	M	M	S

Title of theCourse	**PHARMOCOGNOSYANDPHYTOCHEMISTRY**						
PaperNo.	**ElectiveVI**						
Category	**Elective**	**Year**	II	**Credits**	3	**Course Code**	P23CHE44B
		Semester	IV				
Instructionalh oursperweek	**Lecture**	**Tutorial**	**LabPractice**		**Total**		
	4	1	-		5		
Prerequisites	Basicknowledgeof Chemistry						
Objectives of thecourse	Todeveloptheknowledgeofnaturalproducts,biologicalfunctionsandpharmacologicaluses. Todevelopknowledgeonprimaryandsecondarymetabolitesandtheirsources. Tounderstandtheconceptsofisolationmethodsandseparationofbioactivecompounds. Toprovidetheknowledgeonselectedglycosidesandmarinedrugs. TofamiliarizetheguidelinesofWHOanddifferentsamplingtechniques.						
CourseOutline	**UNIT-I:PharmacognosyandStandardizationofHerbaldrugs:**Introduction,definition,developmentclassificationandSourceofDrugs:Biological,mineral,marine,andplanttissuecultures.Studyofpharmacognostic of a crude drug. Biosynthesis: Shikimic acid pathwayandacetatepathway.SystematicanalysisofCrudedrugs.Standardization of Herbal drugs. WHO guidelines, Sampling of crudedrug, Methodsofdrugevaluation.Determinationof foreignmatter,moistureAshvalue.Phytochemicalinvestigations-Generalchemicaltests.						

	UNIT-II:ExtractionTechniques: Generalmethodsofextraction,types – maceration,Decoction,percolation,Immersionandsoxhletextraction.Advanced techniques- counter current, steam distillation, supercriticalgases, sonication, Micro waves assisted extraction. Factors affecting thechoiceofextraction process.

	UNIT-III:DrugscontainingTerpenoidsandvolatileoils: Terpenoids:Classification,Isoprenerule,Isolationandseparationtechniques,GeneralpropertiesCamphor,Menthol,Eucalyptol.VolatileOilsorEssential Oils: Method of Preparations, Classifications of Volatile oils,Camphoroil,Geraniumoil,Citral-Structureuses.Pentacyclictriterpenoids:amyrines;taraxasterol:Structureandpharmacological applications.
	UNIT-IV:Drugscontainingalkaloids: Occurrence,functionofalkaloids in plants, pharmaceutical applications. Isolation, PreliminaryQualitative tests and general properties. General methods of structuralelucidation.Morphine,Reserpine,papaverine-chemicalproperties, structureanduses. papaverine-structure, chemicalpropertiesanduses.
	UNIT-V:PlantGlycosidesandMarinedrugs: Glycosides:Basicringsystem,classification,isolation,properties,qualitativeanalysis.PharmacologicalactivityofSennaglycosides,Cardiacglycosides-Digoxin,digitoxin,Steroidalsaponinsglycosides-Diosgenin,hecogenin.Plantpigments:Occurrenceandgeneralmethodsofstructuredetermination,isolationandsynthesisofquercetinandcyanidinchloride.Marinedrugs-SelectedDrugMolecules: Cardiovascular active substances, Cytotoxic compounds, antimicrobialcompounds, antibiotic compounds, Anti-inflammatory agents. Marinetoxins.
ExtendedProfessionalComponent (is apart of internalcomponent only,Not to be includedin the externalexamination questionpaper)	Questions related to the above topics, from various competitiveexaminationsUPSC/TRB/NET/UGC-CSIR/GATE/TNPSCotherstobe solved (Tobediscussed during theTutorial hours)
Skills acquiredfromthiscourse	Knowledge.

RecommendedText	1. Gurdeep R Chatwal (2016), Organic chemistry of Naturalproducts,Volume I&II,5thedition,HimalayapublishingHouse. 2. S.V.Bhat,B.A.Nagasampagi,M.Sivakumar(2014),ChemistryofNaturalProducts, Revised edition, NarosaPublishers.
ReferenceBooks	1. Jeffrey B. Harborne(2012), Phytochemical methods: A Guide toModernTechniquesofPlantAnalysis,4thedition,Indianreprint,Springer. 2. Ashutoshkar (2007), Pharmacognosy and Pharmacobiotechnology, 2ndedition, New ageinternational(P) limited, NewDelhi.

CourseLearningOutcomes(forMappingwithPOs andPSOs)

Studentswill beable:

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 analyzethe isolated drugs

CO4: Toapplyvarious techniquestodiscover newalternative medicines.

CO5: Toevaluatethe isolateddrugsforvarious pharmacologicalactivities

CO-POMapping(CourseArticulationMatrix)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**S**	**S**	**S**	**S**	**M**	**S**
CO2	**M**	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**	**S**
CO4	**M**	**S**	**S**	**S**	**S**	**M**
CO5	**M**	**S**	**M**	**S**	**S**	**M**

Titleofthe Course	**Project with Viva**						
PaperNo.	**Core 13**						
Category	**Elective**	**Year**	I	**Credits**	7	**Course Code**	P23CH4PRO
		Semester	IV				
Instructional hoursperweek	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
			10			10	
Prerequisites	**BasicknowledgeonExperimental Chemistry**						

Objectivesofthe course	1.To impart skills in synthesizing new compounds 2.To enable students to learn and apply characterization techniques including spectroscopy 3.To familiarize various sources of literature survey 4.To provide knowledge on scientific writing and enable students to present their findings as dissertation
Course Outline	1.Analyze the existing problems for which research can provide solutions and select the problem for research 2.Know the various chemical publishers, journals and perform literature survey 3.Synthesize new chemical compounds through various methods 4. Characterize the compounds using various analytical and spectroscopical studies.

Titleofthe Course	**Chemistry for Advanced Research Studies**						
PaperNo.	**SEC-2**						
Category	**Elective**	**Year**	I	**Credits**	3	**Course Code**	P23CHS42
		Semester	IV				
Instructional hoursperweek	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	1	-			5	
Prerequisites	**BasicknowledgeonChemistry**						
Objectivesofthe course	Understandtheformationanddetectionofreactionintermediatesoforganic reactions. Identify the bonding and structure of coordination complexes. Appreciate the importance of crystallography Corelate the structure and spectra of molecules Appreciate the importance of nanodevices						
Course Outline	**UNIT-I: Reactiveintermediatesand Nucleophilic substitution reactions** Reactive intermediates: Carbocations and carbanions, generation, stability and reactivity. Aromatic nucleophilic substitution: S_N1, S_N2 mechanisms. Rearrangements to electron deficient carbon: Pinacol-pinacoloneHofmann, Curtius, Schmidt, Lossen Rearrangements. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: Sulphonation						

	UNIT-II-Chemistry & Spectra of Coordination Compounds Coordination compounds-Types of ligands, Crystal field theory (CFT) – Crystal field splitting in octahedral, tetrahedral and square planar complexes - Crystal field stabilization energy and its applications – factors affecting CFSE – spectrochemical series – Jahn-Teller distortion-application of d-orbital splitting to explain magnetic properties, Term symbols for ions – splitting of orbitals and terms in crystal fields – characteristics of d-d transitions – Orgel diagram, Charge Transfer Spectra
	UNIT-III: Crystallography Crystal structure -Lattices and symmetries -Reciprocal lattice- Crystal symmetry- Point groups Plane groups and space group -Screw Axis and Glide planes; Diffraction of light – principles X-ray diffraction: Practical aspects of X-ray diffraction, Powder X-ray diffraction, Principles and application.

	UNIT-IV: Spectroscopy IR Spectra – Principle, -Hooke's law – factors affecting vibrational frequencies – characteristic group frequencies – Finger print region and applications- Hydrogen bonding effect of inductive and mesomeric effects on carbonyl stretching frequency- effect of ring strain on carbonyl stretching frequency. NMR spectroscopy- Principle, Instrumentation – origin of NMR spectra – chemical shift – number of signals – peak areas – multiplicity – geminal, vicinal and long-range couplings – factors affecting chemical shifts and coupling constants and applications.
	UNIT-V: Nanotechnology and Nanodevices DNA as a nanomaterial – DNA – knots and junctions, DNA – nanomechanical device designed by Seeman. Force measurements in simple protein molecules and polymerase – DNA complexes– molecular recognition and DNA based sensor.
Extended Professional Component (is a part of internal component only, Nottobeincluded in the external examinationquestionpaper)	Questions related to the above topics, from various competitive examinationsUPSC/TRB/NET/UGC-CSIR/GATE /TNPSCothers to be solved (TobediscussedduringtheTutorial hours)

Skills acquired fromthiscourse	Knowledge.

Text Books	1. J.D. Lee, Concise Inorganic Chemistry, 5th Ed, Wiley, 1999. 2. J.E.Huheey,E.A.KeiterandR.L.Keiter,InorganicChemistry; 4thed.;HarperandRow:NewYork,1983. 3. K. J. Klabunde (Ed), Nanoscale Materials in Chemistry; 2nd Ed., Wiley- Interscience, NewYork, 2009. 4. Jack D.Dunitz X-ray Analysis and The Structure of Organic Molecules, 1979.
Reference Books	1.Giacavazzoet.al.,FundamentalsofCrystallography,International Union of Crystallography. Oxford Science Publications, 2010 2.K. F. Purcelland J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977. 3. JamesF. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Course Outcomes	On learning the course, the students will be able to 1.Understandtheformationanddetectionofreactionintermediatesoforganic reactions. 2. Identify the bonding and structure of coordination complexes. 3. Appreciate the importance of crystallography 4. Corelate the structure and spectra of molecules 4.Appreciate the importance of nanodevices

Mapping of Cos with POs &PSOs:

PO/ PSO	PO 1	PO 2	PO 3	P O	PO 5	PO 6	PSO 1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PS O8

				4										
CO 1	S	M	M	M	M	S	S	S	M	M	M	M	M	S
CO 2	S	M	M	M	M	S	S	S	M	M	M	M	M	S
CO 3	S	M	M	M	M	S	S	S	M	M	M	M	M	S
CO 4	S	M	M	M	M	S	S	S	M	M	M	M	M	S