MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL - 624101

DEPARTMENT OF CHEMISTRY

M.Sc. Chemistry

Curriculum Framework, Syllabus, and Regulations

(Based on TANSCHE Syllabus under Choice Based Credit System - CBCS)

(For the candidates to be admitted from the Academic Year 2023-24)

SYLLABUS FRAMEWWORK FOR M. Sc CHEMISTRY (As per TANSCHE from 2023-24)

SEMESTER I					
S. No	**Course Components**	**Course Code**	**Course Title**	**Credits**	**Hours per week**
1	Core-I	P23CHT11	Organic Chemistry- I	5	7
2	Core-II	P23CHT12	Inorganic Chemistry- I	5	7
3	Core-III	P23CHP11	Organic Chemistry Practical	4	6
4	Elective I (Discipline Specific)	P23CHE1A/ P23CHE1B//	Pharmaceutical Chemistry/Nanomaterials and Nanotechnology	3	5(4L+ 1T)
5	Elective II (Generic)	P23WSG11	Women Empowerment	3	5(4L+ 1T)
			Total	**20**	**30**

SEMESTER II					
S. No		**Course Code**		**Credit**	**Hours per Week**
1	Core -IV	P23CHT23	Organic Chemistry- II	5	6
2	Core -V	P23CHT24	Physical Chemistry-I	5	6
3	Core -VI	P23CHP22	Inorganic Chemistry Practical	4	6
4	Elective III(Discipline Specific)	P23CHE2A P23CHE2B /	Medicinal Chemistry/Material Chemistry	3	4
5	Elective IV (Generic)	P23CSG22	Cyber security	3	4
6	NME- Skill Enhancement Course (SE1)	P23CHS1A/ P23CHS1B	Chemistry in Everyday Life/ Agricultural Chemistry	2	4
			Total	**22**	**30**

1. About the Department

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 instrumentation and equip students to meet the global requisites for employment. The Department offers M. Sc., M. Phil., and Ph. D programs.The Department is specialized in research areas such as Coordination Chemistry, X-ray- crystallography, Medicinal Chemistry and Bioinorganic Chemistry.

2. About the Programme

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 with experimental and analytical skills in addition to sound theoretical knowledge in various 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. Programme Educational Objectives (PEOs))

PEO1: To provide a sound knowledge in Chemistry with scientific reasoning and analytical problem solving skills

PEO2: To inculcate scientific temper and research attitude and provide adequate training in Synthesis, Characterization and Instrumentation

PEO3: To equip the students with skills for employability & entrepreneurship

PEO4: To enable the learners to apply the knowledge acquired in frontier areas of chemistry for new research and technology and solve the problems of the society related to Environment & health

4.Eligibility

B. Sc. Chemistry degree with Mathematics/ Physics/ Botany/Zoology as one of the Allied subjects

5. General Guidelines for PG 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. **Medium of Instruction: English**
c. **Question paper pattern for External examination for Core and Elective papers:**

Theory Paper (Bloom's Taxonomy based)

Intended Learning Skills	**Maximum 75 Marks** **Passing Minimum: 50%** **Duration: Three Hours**
Memory Recall/Example/ Counter Example / Knowledge about the Concepts/Understanding	**Part–A (10x2=20Marks)** Answer ALL questions **Each Question carries 2 marks**
	Two questions from each Unit
	Question 1 toQuestion10
Descriptions/Application (problems)	**Part–B (5x5=25Marks) Answer ALL questions** **Each question carries 5 Marks**
	Either - or Type Both parts of each question from the same Unit
	Question 11 (a) or 11(b) to **Question 15(a) or 15(b)**
Analysis/Synthesis / Evaluation	**Part-C (3x 10 = 30 Marks)** **Answer any THREE questions** **Each question carries 10 Marks**
	There shall be FIVE questions covering all the five units
	Question 16 to Question 20

***Minimum credits required to pass: 91**

- **Project Report**

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 pages in Times New Roman font with 1.5 line space.

- **Project Evaluation**

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. Conversion of Marks to Grade Points and Letter Grade(Performance in a Course/ Paper)

Range of Marks	Grade Points	Letter Grade	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+	Very Good
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

Students must have earned 75% of attendance in each course for appearing for the examination. Students with 71% to 74% of attendance must apply for condonation in the Prescribed Form with prescribed fee. Students with 65% to 70% of attendance mustapply for condonation in the Prescribed Form with the prescribed fee along with the Medical Certificate. Students with attendance 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 of the Department, Principal and the Registrar of the University.

8. Maternity Leave

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. Any Other Information

In addition to the above mentioned regulations, any other common regulations pertaining to the UG Programmes are also applicable for this Programme.

Programme Outcomes (POs)

On completion of the Programme the learners will

1. Understand and appreciate the importance of Chemistry as a central science by the knowledge of its diverse applications.
2. Have sound knowledge of the fundamental and advanced concepts of applications of chemical and scientific theories.
3. Acquire experimental skills required for employment in chemical and pharmaceutical industry.
4. Develop analytical and problem-solving skills
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.

Programme Specific Outcomes (PSOs)

On completion of the M.Sc. Chemistry program, the students will be able to:

PSO1: Demonstrate comprehensive knowledge and understanding of both theoretical and experimental /applied chemistry including specialized areas of Organic Chemistry,Inorganic Chemistry, Physical Chemistry, analytical Chemistry, Medicinal Chemistry, Environmental Chemistry, Nano Chemistry and Elective subjects.

PSO2: Use advanced instruments and related for in-depth characterization of materials/ Chemical Analysis and separation technology with the help of theoretical knowledge.

PSO3: Understand the importance of Chemistry in societal and environmental contexts for sustainable development

PSO4: Utilize the principles of scientific enquiry and analytical thinking while solving problems and making decisions

PSO5: Open up new methods for environmental pollution & apply green/sustainable chemistry approach towards planning and execution of research in frontier areas of chemical sciences

PSO6: Deduce the structure of compounds using various characterization techniques

PSO7: Analyze & appreciate the different types polymers, supramolecular materials, Naturally available chemicals and their synthetic congeners

PSO8: Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories

SEMESTER-I

<table>
<tr><td>Title of the Course</td><td colspan="7">ORGANIC CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core I</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">P23CHT11</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="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">Basic concepts of organic chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the concept of aromaticity
To understand the feasibility and the mechanism of various organic reactions.
To comprehend the techniques in the determination of reaction mechanisms.
To understand the concept of stereochemistry involved in organic compounds.
To correlate and appreciate the differences involved in the various types of organic reaction mechanisms.</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="7">UNIT-I:Reactive intermediates and Aromaticity

Carbocations, carbanions, carbenes, benzynes and nitrenes Generation, stability and reactivity

Aromatic character: Six-, five-, seven-, and eight- membered rings - Other systems with aromatic sextets – Huckel‟s theory of aromaticity, concept of homoaromaticity and antiaromaticity, Electron occupancy in MO‟s and aromaticity - NMR concept of aromaticity and antiaromaticity, systems with 2,4,8 and 10 electrons, systems with more than 10 electrons, alternant and non-alternant hydrocarbons (azulene type). Bonding properties of systems with (4n+2) pi-pi electrons and 4npi electrons, Heteroaromatic molecules, Annulenes, heteroannulenes, syndones and fullerenes. Craig’s rule, Hammond’s postulate.</td></tr>
<tr><td colspan="7">UNIT-II:Aromatic and Aliphatic Electrophilic Substitution:
Aromatic electrophilic substitution: Orientation and reactivity of di- and polysubstituted phenol, nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: sulphonation; Halogen electrophiles: chlorination and bromination; Carbon electrophiles: Friedel-Crafts alkylation, acylation and arylation reactions.Aliphatic electrophilic substitution Mechanisms: SE2 and SEi, SE1- Mechanism and evidences.</td></tr>
<tr><td colspan="7">UNIT-III:Aromatic and Aliphatic Nucleophilic Substitution:Aromatic</td></tr>
</table>

	nucleophilic substitution: Mechanisms - S_NAr, S_N1 and Benzyne mechanisms - Evidences - Reactivity, Effect of structure, leaving group and attacking nucleophile. Reactions: Oxygen and Sulphur-nucleophiles, Bucherer and Rosenmund reactions, Sommelet- Hauser and Smiles rearrangements. S_N1, ion pair, S_N2 mechanisms and evidences. Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon.S_N1, S_N2, S_Ni, and S_E1 mechanism and evidences.
	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, asymmetric synthesis, destruction. Stereoselective and stereospecific synthesis.
	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 electron rich atom: Favorskii, Stevens, [1,2]-Wittig and [2,3]-Wittig rearrangements.Fries and Photo Fries rearrangement.Intramolecular rearrangements – Claisen, Cope, oxy-Cope Benzidine rearrangements.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J. March and M. Smith, Advanced Organic Chemistry, 5th edition, John-Wiley and Sons.2001. 2. E. S. Gould, Mechanism and Structure in Organic Chemistry, Holt, Rinehart and Winston Inc., 1959. 3. P.S.Kalsi, Stereochemistry of carbon compounds, 8th edition, New

	Age International Publishers, 2015. 4. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013. 5. J.Clayden, N. Greeves, S. Warren, Organic Compounds, 2nd edition, Oxford University Press, 2014.
Reference Books	1. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part-A and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007. 2. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 2001. 3. N.S. Isaacs, Physical Organic Chemistry, ELBS, Longman, UK, 1987. 4. E. L. Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000. 5. I. L. Finar, Organic chemistry, Vol-1&2, 6th edition, Pearson Education Asia, 2004.
Website and e-learning source	1.https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able

CLO1: To recall the basic principles of organic chemistry.

CLO2: To understand the formation and detection of reaction intermediates of organic reactions.

CLO3: To predict the reaction mechanism of organic reactions and stereochemistry of organic compounds.

CLO4: To apply the principles of kinetic and non-kinetic methods to determine the mechanism of reactions.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

<table>
<tr><td>Title of the Course</td><td colspan="7">INORGANIC CHEMISTRY-I</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core II</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">P23CHT12</td></tr>
<tr><td>Semester</td><td>I</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>6</td><td>1</td><td colspan="3">-</td><td colspan="2">7</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic concepts of Inorganic Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the concepts of bonding and identify the structure and bonding of simple molecules
To gain fundamental knowledge on the structural aspects of ionic crystals.
To understand the various types of solid-state packing, types of chemical forces, and defects
To gain knowledge on the structural properties of main group compounds and structures.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT-I: Covalent Bonding

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 homo and hetero nuclear diatomic systems – bond length, bond order and bond energy, Application to small molecules such as $BeCl_2$, BCl_3</td></tr>
</table>

	and CCl_4, SF_4, ionic character in a covalent bond. The concept of 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 -normal and inverse types and perovskite structures-examples.
	UNIT-III: Metallic Bonding and defects in solids Band theory – features and its application of conductors, insulators and semiconductors, Intrinsic and extrinsic semiconductors; Superconductivity, Defects in crystals – point defects (Schottky, Frenkel, metal excess and metal deficient) and their effect on the electrical and optical property, laser and phosphors; Linear defects and its effects due to dislocations, Plane defects
	UNIT-IV: **Structure of main group compounds** 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, silicon nitrides, siloxanes. P-N compounds, cyclophosphazenes and cyclophosphazanes. S-N compounds – S_4N_4, $(SN)_x$.
	UNIT-V: **Interhalogens and Polymeric Inorganic Compounds** Pseudo halogens; , Structure and bonding in ClF_3, BrF_3 , BrF_5 , IF_5, IF_7 etc . Isopoly and heteropoly acids – Structure and bonding of 6- and 12-isopoly and 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 (is a part of internal	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)

component only, Not to be included in the external examination question paper)	
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. A R West, Solid state Chemistry and its applications, 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. Purcell and J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977. 5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry; 4th ed.; Harper and Row: NewYork, 1983.
Reference Books	1. D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and Models in Inorganic Chemistry, 3rd Ed, 1994. 2. R J D Tilley, Understanding Solids - The Science of Materials, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2nd Edition, Cambridge University Press, 199. 4. T. Moeller, Inorganic Chemistry, A Modern Introduction; John Wiley: New York, 1982. 5. D. F. Shriver, P. W. Atkins and C.H. Langford; Inorganic Chemistry; 3rd ed.; Oxford University Press: London, 2001.
Website and e-learning source	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to

CO1: Predict the geometry of main group compounds and clusters.

CO2: Explain about the packing of ions in crystals and apply the radius ratio rule to predict the coordination number of cations.

CO3: Understand the various types of ionic crystal systems and analyze their structural features.

CO4: Explain the crystal growth methods.

CO5:To understand the principles of diffraction techniques and microscopic techniques.

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 – Low

Level of Correlation between PSO's and CO's

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

<table>
<tr><td>Title of the Course</td><td colspan="7">ORGANIC CHEMISTRY PRACTICAL</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core III</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">P23CHP11</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>-</td><td>1</td><td colspan="3">5</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic concepts of organic chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the concept of separation, qualitative analysis and preparation of organic compounds.
To develop analytical skill in the handling of chemical reagents for separation of binary and ternary organic mixtures.
To analyze the separated organic components systematically and derivatize them suitably.
To construct suitable experimental setup for the organic preparations involving two stages.</td></tr>
</table>

	To experiment different purification and drying techniques for the compound processing.
Course Outline	**UNIT-I:Separation and analysis:** A. Two component mixtures. B. Three component mixtures.
	UNIT-II: **Estimations: (any five)** a) Estimation of Phenol (bromination) b) Estimation of Aniline (bromination) c) Estimation of Ethyl methyl ketone (iodimetry) d) Estimation of Glucose (redox) e) Estimation of Ascorbic acid (iodimetry) f) Estimation of Aromatic nitro groups (reduction) g) Estimation of Glycine (acidimetry) h) Estimation of Formalin (iodimetry) i) Estimation of Acetyl group in ester (alkalimetry) j) Estimation of Hydroxyl group (acetylation) **k)** Estimation of Amino group (acetylation)
	UNIT-III: Two stage preparations: (any four) a) *p*-Bromoacetanilide from aniline b) *p*-Nitroaniline from acetanilide c) 1,3,5-Tribromobenzene from aniline d) Acetyl salicyclic acid from methyl salicylate e) Benzilic acid from benzoin f) *m*-Nitroaniline from nitrobenzene g) *m*-Nitrobenzoic acid from methyl benzoate
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. A R West, Solid state Chemistry and its applications, 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.
Reference Books	1. D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and Models in Inorganic Chemistry, 3rd Ed, 1994.

	2. R J D Tilley, Understanding Solids - The Science of Materials, 2nd edition, Wiley Publication, 2013. 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State Chemistry, 2nd Edition, Cambridge University Press, 199.
Website and e-learning source	https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry-fall-2018/video_galleries/lecture-videos/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: To recall the basic principles of organic separation, qualitative analysis and preparation.

CO2: To explain the method of separation and analysis of separated organic mixtures and convert them as derivatives by suitable preparation method.

CO3: To determine the characteristics of separation of organic compounds by various chemical reactions.

CO4: To develop strategies to separate, analyze and prepare organic compounds.

CO5:To formulate a method of separation, analysis of organic mixtures and design suitable procedure for organic preparations.

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

<table>
<tr><td>itle of the Course</td><td colspan="8">PHARMACEUTICAL CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="8">Elective I</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">P23CHE1A</td></tr>
<tr><td>Semester</td><td>I</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="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">Basic knowledge on drugs and doses</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">To understand the advanced concepts of pharmaceutical chemistry.
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.
To familiarize on the drug dosage and its structural activities.</td></tr>
<tr><td rowspan="3">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- Dielectric constant 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-Newtonian system- Plastic flow, Pseudoplastic flow, Dilatent flow. Viscosity measurements- selection of viscometer for Newtonian and non-Newtonian system.</td></tr>
<tr><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, for research and sterilization.Physico Chemical Properties and drug action. Physico chemical properties of drugs (a) Partition coefficient, (b) solubility (c) surface activity, (d) degree of ionization.</td></tr>
<tr><td colspan="8">UNIT-III: Drug dosage and product development: Introduction to drug dosage Forms & Drug Delivery system – Definition of Commonterms. Drug Regulation and control,pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms. Drug dosage and product development. Introduction to drug dosage Forms & Drug Delivery system – Definition of Common terms. Drug Regulation and</td></tr>
</table>

	control,pharmacopoeias formularies, sources of drug, drug nomenclature, routes of administration of drugs products, need for a dosage form, classification of dosage forms.
	UNIT-IV:Development of new drugs: Introduction,procedure followed in drug design, 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 structure activity relationship(QSAR): Development of QSAR, drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionizationconstants, steric parameters, chelation parameters, redox potential, indicator-variables.
	UNIT-V:Computers in Pharmaceutical Chemistry: Need of computers for chemistry. Computers for Analytical Chemists-Introduction to computers: Organization of computers, CPU, Computer memory, I/Odevices, information storage, software components. Application of computers in chemistry: Programming in high level language (C+) to handle various numerical methods in chemistry – least square fit, solution to simultaneous equations, interpolation, extrapolation, data smoothing, numerical differentiation andintegrations.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Physical Chemistry- Bahl and Tuli. 2. Text Book of Physical Pharmaceutics, IInd edition, Vallabh Prakashan-.C.V.S. Subramanyam. 3. Medicinal Chemistry (Organic Pharmaceutical Chemistry), G.R Chatwal, Himalaya Publishing house. 4. Instrumental method of Analysis: Hubert H, Willard,7th edition. 5. Textbook of Pharmaceutical Chemistry by,Jayshree Ghosh, S. Chand & company Ltd.Pharmaceutical Chemistry by Dr. S. Lakshmi, Sultanchand & Sons.
Reference Books	1. Computers in chemistry, K.V. Raman, Tata Mc.Graw-Hill, 1993.

	2. Computers for Chemists, S.K Pundir, Anshu bansal, A pragate prakashan., 2 nd edition, New age international (P) limited, New Delhi. 3. Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins. 4. Cooper and Gunn's Tutorial Pharmacy ,6th edition by S.J. Carter, CBS Publisher Ltd. 5. Ansels pharmaceutical Dosage forms and Drug Delivery System by Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd.
Website and e-learning source	https://www.ncbi.nlm.nih.gov/books/NBK482447/ https://training.seer.cancer.gov/treatment/chemotherapy/types.html

Course Learning Outcomes (for Mapping with POs and PSOs)
Students will be able:

CO1: To identify the suitable drugs for various diseases.
CO2: To apply the principles of various drug action and drug design.
CO3: To acquire the knowledge on product development based on SAR.
CO4: To apply the knowledge on applications of computers in chemistry.
CO5:To synthesize new drugs after understanding the concepts SAR.

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO'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
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

<table>
<tr><td>Title of the Course</td><td colspan="7">NANO MATERIALS AND NANO TECHNOLOGY</td></tr>
<tr><td>Paper No.</td><td colspan="7">Elective I</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">P23CHE1B</td></tr>
<tr><td>Semester</td><td>I</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 crystallography and material science</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the concept of nano materials and nano technology.
To understand the various types of nano materials and their properties.
To understand the applications of synthetically important nano materials.
To correlate the characteristics of various nano materials synthesized by new technologies.
To design synthetic routes for synthetically used new nano materials.</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 of nanomaterials, Tools of the nanoscience. Applications of nanomaterials and technologies.</td></tr>
<tr><td colspan="7">UNIT-II:Bonding and structure of the nanomaterials, Predicting the Type of Bonding in a Substance crystal structure.Metallic nanoparticles, Surfaces of Materials, Nanoparticle Size and Properties.Synthesis- Physical and chemical methods - inert gas condensation, arc discharge, laser ablation, sol-gel, solvothermal and hydrothermal-CVD-types, metallo organic, plasma enhanced, and low-pressure CVD. Microwave assisted and electrochemical synthesis.</td></tr>
<tr><td colspan="7">UNIT-III:Mechanical properties of materials, theories relevant to mechanical properties.Techniques to study mechanical properties of nanomaterials, adhesion and friction, thermal properties of nanomaterialsNanoparticles: gold and silver, metal oxides: silica, iron oxide andalumina - synthesisandproperties.</td></tr>
<tr><td colspan="7">UNIT-IV:Electrical properties, Conductivity and Resistivity, Classification of Materials based on Conductivity, magnetic properties, electronic properties of materials. Classification of magnetic phenomena.Semiconductor materials – classification-Ge, Si, GaAs, SiC, GaN, GaP, CdS,PbS. Identification of materials as p and n –type semiconductor-Hall effect - quantum and anomalous, Hall voltage - interpretation of charge carrier density. Applications of</td></tr>
</table>

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

CO1: To explain methods of fabricating nanostructures.
CO2: To relate the unique properties of nanomaterials to reduce dimensionality of the material.
CO3: To describe tools for properties of nanostructures.
CO4: To discuss applications of nanomaterials.
CO5:To understand the health and safety related to nanomaterial.

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

SEMESTER-II

<table>
<tr><td>Title of the Course</td><td colspan="7">ORGANIC CHEMISTRY-II</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core IV</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">P23CHT23</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">Basic knowledge of organic chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the concept of aromaticity in benzenoid, non-benzenoid, heterocyclic and annulene compounds.
To understand the mechanism involved in various types of organic reactions with evidences.
To understand the applications of synthetically important reagents.
To correlate the reactivity between aliphatic and aromatic compounds.
To design synthetic routes for synthetically used organic reactions.</td></tr>
<tr><td rowspan="3">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-conformational free energy-conformational isomers and atropisomers-population of conformers-influence of dipole-dipole repulsion, van der Waals 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 colspan="7">UNIT-II Dynamic stereochemistry conformation and reactivity
Conformation and reactivity in acyclic systems – stereo electronic and steric factors – simple examples illustrating E2 and cis eliminations, intramolecular rearrangements ,Winstein Elliel Equation, Steric assisted and steric hindered reaction. Simple reactions illustrating stereo and stereo-electronic factors – esterfication, oxidation, nucleophilic substitution at ring carbons and elimination reactions - reactions involving intramolecular rearrangements – formation and cleavage of epoxides and neighbouring group participation – reactions of enols and enolates.</td></tr>
<tr><td colspan="7">UNIT-III: Oxidation and Reduction Reactions: Dehydrogenation by quinones, selenium dioxides, mercuric acetate lead tetraacetate, permanganate, peroxides, peracids, osmium tetroxide, oxidation of</td></tr>
</table>

	saturated hydrocarbons, alkyl groups, alcohols, halides and amines. Reduction of organic compounds with reagents based on $LiAlH_4$, $NaBH_4$, Raney Ni hydrazine, formic acid and dissolving metals. Clemmenson reaction, Wolf Kishner reduction, Birch Reduction.
	UNIT-IV: Reagents and Modern Synthetic Reactions: Use of the following reagents in organic synthesis and functional group transformation – 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), Copper diacetylacetonate ($Cu(acac)_2$), $TiCl_3$-.Suzuki coupling, Heck reaction.
	UNIT-V:.Asymmetric Synthesis Importance of asymmetric synthesis – problems with resolution methods – optical purity - enantiomeric excess – diastereomeric excess – chiral, substrate controlled, auxillary controlled, catalyst controlled and solvent controlled asymmetric synthesis, example for each case, synthesis of longifolene by EJ Corey method.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J. March and M. Smith, *Advanced Organic Chemistry*, 5th ed., 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, *Organic Chemistry*, 7thedn.,Prentice Hall, 2013. 5. R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee *Organic Chemistry*, 7th edn., Pearson Education,2010.
Reference Books	1. S. H. Pine, *Organic Chemistry*, 5thedn, McGraw Hill International Editionn,1987. 2. L. F. Fieser and M. Fieser, *Organic Chemistry*, Asia Publishing

	House, Bombay,2000. 3. E.S. Gould, *Mechanism and Structure in Organic Chemistry*, Holt, Rinehart and Winston Inc.,1959. 4. T. L. Gilchrist, *Heterocyclic Chemistry*, Longman Press, 1989. 5. J. A. Joule and K. Mills, *Heterocyclic Chemistry*, 4th ed., John-Wiley,2010.
Website and e-learning source	1.https://sites.google.com/site/chemistryebookscollection02/home/organic-chemistry/organic 2. https://www.organic-chemistry.org/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: To recall the basic principles of aromaticity of organic and heterocyclic compounds.
CO2: To understand the mechanism of various types of organic reactions.
CO3: To predict the suitable reagents for the conversion of selective organic compounds.
CO4: To correlate the principles of substitution, elimination, and addition reactions.
CO5:To design new routes to synthesis organic compounds.

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

<table>
<tr><td>Title of the Course</td><td colspan="7">PHYSICAL CHEMISTRY-I</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core V</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">P23CHT24</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">Basic concepts of physical chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To recall the fundamentals of thermodynamics and the composition of partial molar quantities.
To understand the classical and statistical approach of the functions
To correlate the theories of reaction rates for the evaluation of thermodynamic parameters and study the mechanism and kinetics of reactions.
To gain and apply the knowledge on the concepts and laws of electrochemistry.</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="7">UNIT-I:
Thermodynamics Chemical and Phase Equilibrium
The second law of thermodynamics – Entropy – thermodynamics of systems of variable compositions – partial molar quantities and their determination – chemical potential – Gibbs-Duhem equation – Activity and Fugacity- determination of 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-Application to three component system-CH_3COOH, H_2O and $CHCl_3$ system.</td></tr>
<tr><td colspan="7">UNIT-II: Statistical thermodynamics: Introduction of statistical thermodynamic concepts of thermodynamic and mathematical probabilities- Maxwell - Boltzmann, Fermi Dirac & Bose-Einstein Statistics- applications. Partition functions-evaluation of translational, vibrational and rotational partition functions for monoatomic, diatomic molecules. Thermodynamic functions in terms of partition functions-calculation of equilibrium constants. Specific Heat of solids-Einstein and Debye models.</td></tr>
<tr><td colspan="7">UNIT-III: Kinetics of Reactions
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 equation on reaction rates. Concept of Linear Free Energy Relationships-derivation of Hammett equation-significance of substituent and reaction rate constants - Taft equation - thermodynamic</td></tr>
</table>

	implications of LFER. Experimental methods for the study of fast reaction-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 - Electrochemical cells and applications of standard potentials. Batteries-Primary and secondary fuel cells – Corrosion and corrosion 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 – Multistep processes – Symmetry factor and transfer coefficient – Electro catalysis–Hydrogen evolution reaction as a case study.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. J. Rajaram and J.C. Kuriacose, Thermodynamics for Students of Chemistry, 2nd edition,S.L.N.Chand and Co., Jalandhar, 1986. 2. I.M. Klotz and R.M. Rosenberg, Chemical thermodynamics, 6th edition, W.A.BenjaminPublishers, California, 1972. 3. M.C. Gupta, Statistical Thermodynamics, New Age International, Pvt. Ltd., New Delhi,1995. 4. K.J. Laidler, Chemical Kinetics, 3rd edition, Pearson, Reprint - 2013. 5. J. Rajaram and J.C. Kuriokose, Kinetics and Mechanisms of chemical transformation,Macmillan India Ltd, Reprint - 2011.

Reference Books	1. D.A. Mcqurrie And J.D. Simon, Physical Chemistry - A Molecular Approach, Viva Books Pvt. Ltd., New Delhi, 1999. 2.R.P. Rastogi and R.R. Misra, Classical Thermodynamics, Vikas Publishing, Pvt. Ltd., New Delhi, 1990. 3. S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, Macmillan Publishers, New York, 1974 4. K.B. Ytsiimiriski, "Kinetic Methods of Analysis", Pergamom Press,1996. 5. Gurdeep Raj, Phase rule, Goel Publishing House, 2011.
Website and e-learning source	1. https://nptel.ac.in/courses/104/103/104103112/ 2. https://bit.ly/3tL3GdN

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: To explain the classical and statistical concepts of thermodynamics.

CO2: To compare and correlate the thermodynamic concepts to study the kinetics of chemical reactions.

CO3: To discuss the various thermodynamic and kinetic determination.

CO4: To evaluate the thermodynamic methods for real gases ad mixtures.

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

PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

<table>
<tr><td>Title of the Course</td><td colspan="7">INORGANIC CHEMISTRY PRACTICAL</td></tr>
<tr><td>Paper No.</td><td colspan="7">Core VI</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">P23CHP22</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>-</td><td>1</td><td colspan="3">5</td><td colspan="2">6</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic principles of gravimetric and qualitative analysis</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand and enhance the visual observation as an analytical tool for the quantitative estimation of ions.
To recall the principle and theory in preparing standard solutions.
To train the students for improving their skill in estimating the amount of ion accurately present in the solution
To estimate metal ions, present in the given solution accurately without using instruments.
To determine the amount of ions, present in a binary mixture accurately.</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT-I: Analysis of mixture of cations: Analysis of a mixture of four cations containing two common cations and two rare cations. Cations to be tested.
Group-I : W, Tl and Pb.
Group-II : Se, Te, Mo, Cu, Bi and Cd.
Group-III : Tl, Ce, Th, Zr, V, Cr, Fe, Ti and U.
Group-IV : Zn, Ni, Co and Mn.
Group-V : Ca, Ba and Sr.
Group-VI : Li and Mg.</td></tr>
<tr><td colspan="7">UNIT-II: Preparation of metal complexes: Preparation of inorganic complexes: (any two)
a. Preparation of tristhiourea copper(I)sulphate
b. Preparation of potassium trioxalate chromate(III)
c. Preparation of tetramminecopper(II) sulphate
d. Preparation of Reineck’s salt
e. Preparation of hexathioureacopper(I) chloridedihydrate
f. Preparation of cis-Potassium tri oxalate diaquachromate(III)
g. Preparation of sodium trioxalatoferrate(III)
h. Preparation of hexathiourealead(II) nitrate</td></tr>
</table>

CO-PO

	UNIT-III: Quantitative Analysis a) EDTA titrations: Zn(II), Mg(II), Cu(II), and Ni(II) b) Redox titrations: Fe(II) vs Ce (IV), Fe(II) vs dichromate $NO2^-$ vs Ce (IV) **c)** Spectrophotometric methods of analysis Fe(II), Cu(II) (demonstration only**)**
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. A. JeyaRajendran, Microanalytical Techniques in Chemistry: Inorganic Qualitative Analysis, United global publishers, 2021. 2. V. V. Ramanujam, *Inorganic Semimicro Qualitative Analysis*; 3rded.,The National Publishing Company, Chennai, 1974. 3. *Vogel's Text book of Inorganic Qualitative Analysis,* 4thed., ELBS, London.
Reference Books	1. G. Pass, and H. Sutcliffe, *Practical Inorganic Chemistry*; Chapman Hall, 1965. 2. W. G. Palmer, Experimental *Inorganic Chemistry*; Cambridge University Press, 1954.
Course Learning Outcomes (for Mapping with POs and PSOs) Students will be able: **CO1**: To identify the anions and cations present in a mixture of salts. **CO2**: To apply the principles of semi micro qualitative analysis to categorize acid radicals and basic radicals. **CO3**: To acquire the qualitative analytical skills by selecting suitable confirmatory tests and spot tests. **CO4**: To choose the appropriate chemical reagents for the detection of anions and cations. **CO5**:To synthesize coordination compounds in good quality.	

Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO 1	**S**	**S**	**S**	**S**	**M**	**S**	**S**	**S**	**S**	**M**
CO 2	**M**	**S**	**S**	**S**	**S**	**M**	**S**	**S**	**S**	**S**
CO 3	**S**	**S**	**M**	**S**	**S**	**S**	**S**	**M**	**S**	**S**
CO 4	**M**	**S**	**S**	**S**	**S**	**M**	**S**	**S**	**S**	**S**
CO 5	**M**	**S**	**M**	**S**	**S**	**M**	**S**	**M**	**S**	**S**

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

<table>
<tr><td>Title of the Course</td><td colspan="7">MEDICINAL CHEMISTRY</td></tr>
<tr><td>Paper No.</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>Course Code</td><td>P23CHE2A</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge of medicinal chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To study the chemistry behind the development of pharmaceutical materials.
To gain knowledge on mechanism and action of drugs.
To understand the need of antibiotics and usage of drugs.
To familiarize with the mode of action of diabetic agents and treatment of diabetes.
To identify and apply the action of various antibiotics.</td></tr>
<tr><td rowspan="2">Course Outline</td><td colspan="7">UNIT-I: Introduction to receptors: Introduction, targets, Agonist, antagonist, partial agonist. Receptors, Receptor types, Theories of Drug – receptor interaction, Drug synergism, Drug resistance, physicochemical factors influencing drug action.</td></tr>
<tr><td colspan="7">UNIT-II: Antibiotics: Introduction, Targets of antibiotics action, classification of</td></tr>
</table>

	antibiotics, enzyme-based mechanism of action, SAR of penicllins and tetracyclins, clinical application of penicillins, cephalosporin. Current trends in antibiotic therapy.
	UNIT-III: Antihypertensive agents and diuretics: Classification of cardiovascular agents, introduction to hypertension, etiology, types, classification of antihypertensive agents, classification and mechanism of action of diuretics, Furosemide, Hydrochlorothiazide, Amiloride.
	Unit –IV: Vitamins: Classification of vitamins, biochemical function of vitamins, Vitamins -A, B1, B2, C, E and H-Sources and Deficiency diseases, Recommended dietary allowance(RDA), Structure elucidation and function.
	UNIT-V: Analgesics, Antipyretics and Anti-inflammatory Drugs: Introduction, Mechanism of inflammation, classification and mechanism of action and paracetamol, Ibuprofen, Diclofenac, naproxen, indomethacin, phenylbutazone and meperidine. Medicinal Chemistry of Antidiabetic Agents Introduction, Types of diabetics, Drugs used for the treatment, chemical classification, Mechanism of action, Treatment of diabetic mellitus. Chemistry of insulin, sulfonyl urea.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, 2. Wilson, Charles Owens: Beale, John Marlowe; Block, John H, Lipincott William, 12th edition, 2011. 3. Graham L. Patrick, An Introduction to Medicinal Chemistry, 5th edition, Oxford University Press, 2013. Jayashree Ghosh, A textbook of Pharmaceutical Chemistry,S.Chand and Co.Ltd,1999,1999 edn. 4. O.LeRoy, Natural and Synthetic Organic Medicinal compounds, Ealemi, 1976. 5.S.Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, NewDelhi,1993,New edn.
Reference Books	1. Foye's Princles of Medicinal Chemistry, Lipincott Williams, Seventh Edition, 2012 2. Burger's Medicinal Chemistry, Drug Discovery and Development, Donald J. Abraham, David P. Rotella, Alfred Burger, Academic press, 2010. 3. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical

	Chemistry, John M. Beale Jr and John M. Block, Wolters Kluwer, 2011,12th edn. 4. P. Parimoo, A Textbook of Medical Chemistry, New Delhi: CBS Publishers.1995. 5. S.Ramakrishnan, K.G. Prasannan and R.Rajan, Text book of Medical Biochemistry, Hyderabad: Orient Longman.3rd edition,2001.
Website and e-learning source	1. https://www.ncbi.nlm.nih.gov/books/NBK482447/ 2. https://training.seer.cancer.gov/treatment/chemotherapy/types.html 3. https://www.classcentral.com/course/swayam-medicinal-chemistry-12908

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able to:

CO1: Predict a drugs properties based on its structure.

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

CO3: Explain the relationship between drug's chemical structure and its therapeutic properties.

CO4: Explain different theories of drug actions at molecular level.

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

Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

<table>
<tr><td>Title of the Course</td><td colspan="7">MATERIAL SCIENCE</td></tr>
<tr><td>Paper No.</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 rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">P23CHE2B</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>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge of solid-state chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To understand the crystal structure, growth methods and X-ray scattering.
To explain the optical, dielectric and diffusion properties of crystals.
To recognize the basis of semiconductors, superconductivity materials and magnets.
To study the synthesis, classification and applications of nanomaterials.
To learn about the importance of materials used for 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 and single crystal applications. Electron charge density maps, neutron diffraction-method and applications.</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. Crystal growth methods-nucleation–equilibrium stability and metastable state. Single crystal–Low and high temperature, solution growth– Gel and sol-gel. Melt growth – Bridgeman Stockbarger, Czochralski methods. Flux technique, 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, translucency and opacity. Types of luminescence – 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. dielectric constant, dielectric loss. Types of dielectric breakdown–intrinsic, thermal, discharge, electrochemical and defect breakdown.</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 – Domain theory Hysteresis Loop-Applications. Magneto and gian magneto resistance. Ferro, ferri and anti ferromagnetic materials-applications, magnetic parameters for recording applications. Ferro-,</td></tr>
</table>

	Piezo-, and pyro electric materials – properties and applications. Shape memory Alloys-characteristics and applications, Non-linear optics-Second Harmonic Generators, mixing of Laser wavelengths by quartz, ruby and $LiNbO_3$.
	UNIT-V: Materials for Renewable Energy Conversion: Solar Cells: Organic, bilayer, bulk hetero junction, polymer, perovskite based. Solar energy conversion: lamellar solids and thin films, dye-sensitized photo voltaic cells, coordination compounds anchored onto semiconductor surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical activation and splitting of water, CO2 and N2. Manganese based photo systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - photochemical generation of hydrogen from alcohol.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. S. Mohan and V. Arjunan, Principles of Materials Science, MJP Publishers, 2016. 2. Arumugam, Materials Science, Anuradha Publications, 2007. 3. Giacavazzo et. al., Fundamentals of Crystallography, International Union of Crystallography. Oxford Science Publications, 2010 4. Woolfson, An Introduction to Crystallography, Cambridge University Press, 2012. 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction to Materials Science for Engineers. 6th ed., PEARSON Press, 2007.
Reference Books	1.Suggested Readings 1. M.G. Arora, Solid State Chemistry, Anmol Publications, New Delhi, 2001. 2. R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and Company Ltd, 2001. 3.. C. Kittel, Solid State Physics, John-Wiley and sons, NY, 1966. 4. H.P. Meyers, Introductory Solid State Physics, Viva Books Private Limited, 1998. 5. A.R. West, Solid State Chemistry and Applications, John-Wiley and sons, 1987.
Website and e-learning source	1. http://xrayweb.chem.ou.edu/notes/symmetry.html. 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf. 3. https://bit.ly/3QyVg2R

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: To understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets, nano materials and renewable energy materials.

CO2: To integrate and assess the structure of different materials and their properties.

CO3: To analyse and identify new materials for energy applications.

CO4: To explain the importance of crystal structures, piezoelectric and pyro electric materials, nano materials, hard and soft magnets, superconductors, solar cells, electrodes, LED uses, structures and synthesis.

CO5:To design and develop new materials with improved property for energy applications.

Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

<table>
<tr><td>Title of the Course</td><td colspan="7">CHEMISTRY IN EVERYDAY LIFE</td></tr>
<tr><td>Paper No.</td><td colspan="7">NME</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">NME</td><td>Year</td><td>I</td><td>Credits</td><td>2</td><td>Course Code</td><td>P23CHS1A</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>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge in Everyday Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">1.To enable students understand and appreciate the chemistry behind Dairy Industry
2. To provide knowledge on the various chemicals in food and food adulteration
3. To inculcate the basic knowledge of minerals, cosmetics and cleansing agents.
4. To enable students gain basic knowledge on petrochemicals, polymers, dyes, paints and building materials</td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="7">UNIT I
Dairy Chemistry
General composition of milk – constituents of milk lipids, proteins, carbohydrates, vitamins and minerals. Physical properties of milk – color, odour, acidity, specific gravity, viscosity and conductivity. Factors affecting the composition of milk – pasteurization, homogenization, toning, standardization, reconstitution of milk - adulteration of milk.</td></tr>
<tr><td colspan="7">UNIT-II
Chemicals in food:
Table salt, sugar, baking powder, baking soda, 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, ghee, oil, 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 colspan="7">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:
Talcum Powder, Tooth pastes, Shampoos, Nail Polish, ,</td></tr>
</table>

	Perfumes -General formulations –possible hazards of cosmetics use **Cleansing agents:** Soaps and detergents, cleansing action, bleaching and stain removal
	UNIT-IV:. Chemistry and Industry-I Chemicals in food production: Fertilizers such as urea, NPK and Super phosphates -uses and hazards Pesticides –definition and examples Fertilizers from natural sources Petrochemicals: Generations and composition of petrochemicals, Rocket propellants Polymers and Plastics: Polythene, polyester, PVC, bakelite, resins; Teflon and nylon -their applications Biodegradable polymers and Biopolymers
	UNIT-V: Chemistry and Industry-II Dyes, Paints and Pigments: Composition, Classification and Applications; Process of dying. Building Materials: Cement and its manufacture, Mortar, Concrete and R.C.C Manufacture of glass, Ceramics Rubber: Natural Rubber-Synthetic rubbers-Vulcanization -definition and its applications
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge.
Recommended Text	1. Carl H Snyder**, The Extraordinary Chemistry of Everyday Things**, 4th edition 2003 2. Alfred Vivian, Every day Chemistry, Hard press Publishing, 2012 3. John Emsley Chemistry at Home: Exploring the Ingredients in

	Everyday Products, Royal Society of Chemistry; Illustrated edition, 2015
Reference Books	1. Kirpal Singh, Chemistry in Daily Life: PHI, 3rd Ed., 2010 2. H-D. Belitz, Werner Grosch, Peter Schieberle, Food Chemistry, Springer; 4th revised and extended Ed., 2009
Website and e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

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

CO2: Comprehend the role of chemicals in Food & Nutrition (K1)

CO3: Realize the role of chemistry in food production.(K4)

CO4: Understand andanalyze the role ofchemistry in petrochemical, polymer, and cosmetic Industry (K4)

Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

<table>
<tr><td>Title of the Course</td><td colspan="7">AGRICULTURAL CHEMISTRY</td></tr>
<tr><td>Paper No.</td><td colspan="7">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>Course Code</td><td>P23CHS1B</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Prerequisites</td><td colspan="7">Basic knowledge in Agricultural Chemistry</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">1.To enable students understand the chemical composition of soil
2.To provide knowledge on the chemistry behind fertilizers
3.To enable students know and understand the chemistry behind pesticides
4. To enable students analyze and find a suitable method to promote agriculture.</td></tr>
<tr><td rowspan="4">Course Outline</td><td colspan="7">UNIT I
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 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 colspan="7">UNIT-III: Pesticides, Fungicides, Herbicides And Weedicides

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 colspan="7">UNIT-IV:. Plant Growth Regulators
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 **Insecticides** 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 of insecticides – Symptoms of poisoning, first aid and antidotes
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge.
Recommended Text	1. Joseph Scudder Chamberlain Organic Agricultural Chemistry (the Chemistry of Plants and Animals); A Textbook of General Agricultural Chemistry or Elementary Bio-Chemistry for Use in Colleges, Andesite Press, 2015 2. H. Parameshwar Hegde, Textbook of Agro-Chemistry, Discovery Publishing Pvt. Ltd, 2009
Reference Books	1. G.T. Austin: Shreve's Chemical Process Industries, 5th edition, Mc-Graw-Hill, 1984 3. B.A. Yagodin (Ed). Agricultural Chemistry, 2 Volumes, Mir Publishers (Moscow), 1976
Website and e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)
Students will:
CO1: Have Acquired knowledge on the chemical composition of soil (K1)
CO2: Be able to illustrate the chemistry behind fertilizers and pesticides (K4)
CO3: Be able to appreciate the chemistry behind agricultural methods (K5)
CO4: Be able to find and suggest suitable methods to promote agriculture.(K6)

CO-PO Mapping (Course Articulation Matrix)

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

3 – Strong, 2 – Medium, 1 - Low