



MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

B.Sc. CHEMISTRY (Affiliated Colleges)

LEARNING OUTCOME BASED CURRICULUM

For those who joined in 2023-2024

VISION AND MISSION OF THE UNIVERSITY

VISION:

"To provide quality education to reach the unreached "

MISSION:

- To conduct research, teaching and outreach programmes to improve conditions of human living.
- To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity.
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development.
- To provide quality/inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

VISION AND MISSION OF DEPARTMENT

VISION:

- To make the students excel in the fields of education, fundamental and advanced research in Chemistry by providing quality education so that they can compete and contribute to the varying technology.

MISSION:

- To teach the students to analyze problems ranging from the basics of Chemistry to advanced level.
- To give the students adequate hands on experience to work in applied fields.
- To train the students to act as a useful member or effective leader of a team in multidisciplinary setting.

PREAMBLE

The B.Sc Chemistry programme is fundamental to the revolution taking place in Science and Technology. The aim of the programme is to impart basic skills and knowledge on the principles of all branches of Chemistry to cater to need of Society, Scientific Organization and Industries in the context of developing needs of our country by providing extensive coverage on the fundamental aspects of chemistry relating applications of chemistry to life systems. This course provides intensive practical training to develop associate and apply various aspects of chemistry in day to day life. The programme prepares the students to achieve success in competitive examinations and make developments of needs of their life.

Eligibility for the B.Sc Chemistry Programme

B.Sc Chemistry is a three year Undergraduate course which one can apply after completing 12th from science stream. Eligibility for the course says that the interested must have science with subjects as Physics, Chemistry, Mathematics, Biology or Computer Science as their main subjects from any recognized board.

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

Chemistry: Programme Outcome, Programme Specific Outcome and Course Outcome

Chemistry is the study of composition and transformation of matter. A science that is central to energy production, health care, new material development for electronics and other applied fields and environmental protection. Bachelor's degree in Chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical chemistry and specialized courses such as Pharmaceutical Chemistry, Spectroscopy, Nanoscience, Forensic Science, Cosmetics & Personal Grooming, Food chemistry, Dairy Chemistry and so on. Thus, this programme helps learners in building a solid foundation for higher studies in Chemistry. The hands on experience of the students gain in practicals enable them to apply theory to solve problems in everyday life, think critically and innovatively. An aptitude for research is instilled through project work and industrial internship.

Students completing this programme will be able to present the concepts of Chemistry clearly and precisely. They can find a solution to pressing problems that mankind is facing today. They can interpret data and present their findings to both scientific community and laymen and have ability to work as a team and evolve to become an entrepreneur

Completion of this programme will also enable the learners to join teaching profession, conducting research in Industry and Government run research labs. A B. Sc chemistry student has the option to

diversify to other branches such as Biochemistry, Biotechnology, and Forensic Science etc. They have employability opportunities in public and private sector jobs in energy, Pharmaceutical, Polymer Food, Cosmetic industries etc...

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

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| | <p>experiment or investigation</p> <p>PO7:Cooperation/Teamwork: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team</p> <p>PO 8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p> <p>PO 9 : Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society</p> <p>PO 10: Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.</p> <p>PO 11 : Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p>PO12:Multicultural competence: Possess knowledge of the value and belief of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.</p> <p>PO 13 : Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p> <p>PO 14 : Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p>PO15 : Lifelong learning: Ability to acquire knowledge and skills, including,, learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p> |
| Programme Specific Outcomes | <p>On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:</p> <p>PSO1: Disciplinary Knowledge: Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.</p> <p>PSO2: Critical Thinking: Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively</p> <p>PSO3: Problem Solving: Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.</p> <p>PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and</p> |

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

| PO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|------------|------|------|------|------|------|------|
| PO1 | ✓ | | | | | |
| PO2 | | ✓ | | | | |
| PO3 | | | ✓ | | | |
| PO4 | | | | ✓ | | |
| PO5 | | | | | ✓ | |
| PO6 | | | | | | ✓ |

Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising statistical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced statistical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Statistics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Statistical Quality Control course is included to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting an experiment in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counter parts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest DBMS and Computer software for Analytics.

Value additions in the Revamped Curriculum:

| Semester | Newly introduced Components | Outcome/Benefits |
|---------------|---|--|
| I | Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Statistics and simulating mathematical concepts to real world. | <ul style="list-style-type: none"> • Instil confidence among students • Create interest for the subject |
| I,II, III, IV | Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial) | <ul style="list-style-type: none"> • Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable |
| | | <ul style="list-style-type: none"> • Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational Aspects |
| | | <ul style="list-style-type: none"> • Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc. |
| | | <ul style="list-style-type: none"> • Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self-employment • Creates mall scale entrepreneurs • Training to girls leads to women empowerment |
| | | <ul style="list-style-type: none"> • Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools |

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| III,IV,V&VI | Elective papers- An open choice of topics categorized under Generic and Discipline Centric | <ul style="list-style-type: none"> ● Strengthening the domain knowledge ● Introducing the stakeholders to the State- of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature ● Students are exposed to Latest topics on Computer Science/ IT, that require strong statistical background. ● Emerging topics in higher education / industry/communication network/health sector etc. are introduced with hands-on- training, facilitates designing of statistical models in the respective sectors |
| IV | DBMS and Programming skill, Biostatistics, Statistical Quality Control, Official Statistics, Operations Research | <ul style="list-style-type: none"> ● Exposure to industry mould students into solution providers ● Generates Industry ready graduates ● Employment opportunities enhanced |
| II Year Vacation activity | Internship/ Industrial Training | <ul style="list-style-type: none"> ● Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional Experience and also become responsible citizens. |
| V Semester | Project with Viva– voce | <ul style="list-style-type: none"> ● Self-learning is enhanced ● Application of the concept to real situation is conceived resulting in tangible outcome |
| VI Semester | | <ul style="list-style-type: none"> ● Curriculum design accommodates all category of learners; ‘Statistics for Advanced Explain’ component will comprise of advanced topics in Statistics and allied fields, for those in the peer group /aspiring researchers; ● ‘Training for Competitive Examinations’– cater so the needs of the aspirants towards most sought - after services of the nation viz, UPSC, ISS, CDS, NDA, ● Banking Services, CAT, TNPSC group services, etc. |
| Extra Credits: For Advanced Learners/Honors degree | | <ul style="list-style-type: none"> ● To cater to the needs of peer learners/ research aspirants |

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|---|--|
| Skills acquired from the Courses | <ul style="list-style-type: none"> ❖ Knowledge ❖ Problem Solving ❖ Analytical ability ❖ Professional Competency ❖ Professional Communication ❖ Transferrable Skill |
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1. Template for Curriculum Design for UG Programme in Chemistry

Credit Distribution for UG Programme in Chemistry

B.Sc Chemistry

First Year

Semester-I

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|----------|---|-----------|------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | CoreCourses2(CC1,CC2) | 8 | 8 |
| | ElectiveCourse1(Generic/Discipline Specific)EC1 | 5 | 6 |
| Part-IV | SkillEnhancementCourseSEC-1(Non Major Elective) | 2 | 2 |
| | Foundation Course FC | 2 | 2 |
| | | 23 | 30 |

Semester-II

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|----------|---|-----------|------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 4 |
| Part-III | CoreCourses2(CC3,CC4) | 8 | 8 |
| | ElectiveCourse1(Generic/Discipline Specific)EC2 | 5 | 6 |
| Part-IV | Skill EnhancementCourse-SEC-2 (Non Major Elective) | 1 | 2 |
| | SkillEnhancementCourse-SEC-3(Discipline Specific/Generic) | 1 | 2 |
| | Ability Enhancement Compulsory Course(AECC2)SoftSkill-2 | 2 | 2 |
| | | 23 | 30 |

Second Year

Semester-III

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|-------------|---|---------------|-------------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | CoreCourses2(CC5,CC6) | 6 | 6 |
| | ElectiveCourse1(Generic/Discipline Specific)EC3 | 6 | 6 |
| Part-IV | SkillEnhancementCourse-SEC-4(Entrepreneurial Based) | 2 | 2 |
| | SkillEnhancementCourse-SEC-5(Discipline Specific/Generic) | 2 | 2 |
| | Environmental Studies(EVS) | 2 | 2 |
| | | 24 | 30 |

Semester-IV

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|-------------|---|---------------|-------------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 6 |
| Part-III | CoreCourses2(CC7,CC8) | 8 | 6 |
| | CC7: CoreIndustryModule-1 | | |
| | CC8:AnyCorepaper | | |
| | Elective Course 1(Generic /Discipline Specific)EC4 | 5 | 6 |
| Part-IV | SkillEnhancementCourse-SEC-6 | 1 | 2 |
| | SkillEnhancementCourse-SEC-7(Discipline Specific/Generic) | 2 | 2 |
| | Value education | 2 | 2 |
| | | 24 | 30 |

Third Year Semester-V

| | List of Courses | Credit | Hours per week (L/T/P) |
|----------|---|---------------|-------------------------------|
| Part-III | Core Courses 3(CC9,CC10,CC11) | 12 | 15 |
| | Elective Courses 2(Generic/ Discipline Specific)EC5,EC6 | 6 | 8 |
| | Core /Project with Viva voce CC12 | 3 | 5 |
| Part-IV | Value Education | 2 | 2 |
| | Internship/ Industrial Training (Carried out in II Year Summer vacation)(30hours) | 2 | |
| | Total | 25 | 30 |

Semester-VI

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|-------------|--|---------------|-------------------------------|
| Part-III | Core Courses 3(CC13,CC14,CC15) | 12 | 15 |
| | Elective Courses 2(Generic/Discipline Specific)EC7,EC8 | 6 | 11 |
| Part-IV | Professional Competency Skill Enhancement Course SE8 | 2 | 4 |
| Part-V | Extension Activity (Outside college hours) | 1 | - |
| | | 21 | 30 |

B.Sc CHEMISTRY CURRICULUM DESIGN (2023-2024 batch)

| PART | Subject Code | List of courses | Credit | Hours Per Week L/T/P |
|-------------|---------------------|---|---------------|-----------------------------|
| | | SEMESTER –I | | |
| Part –I | | Tamil/ Malayalam | 3 | 6 |
| Part-II | | English | 3 | 6 |
| Part-III | CC1 | General Chemistry-1 | 5 | 5 |
| | CC2 | Quantitative Inorganic estimation and Inorganic preparation | 3 | 3P |
| | EC1 | Mathematics /Zoology/Botany | 5 | 6 |
| Part- IV | SEC-1 | Food Chemistry / Role of Chemistry in daily life / | 2 | 2L |
| | FC | Foundation course in Chemistry | 2 | 2 |
| | | Total | 23 | 30 |
| | | SEMESTER –II | | |
| Part –I | | Tamil/ Malayalam | 3 | 6 |
| Part-II | | English | 3 | 4 |
| Part-III | CC3 | General Chemistry-II | 5 | 5 |
| | CC4 | Qualitative Organic analysis and preparation of Organic compounds | 3 | 3P |
| | EC2 | Mathematics /Zoology/Botany | 5 | 6 |
| Part- IV | SEC-2 | Dairy Chemistry | 1 | 2 |
| | SEC-3 | Cosmetics and personal grooming | 1 | 2 |
| | | Naan Mudhalvan-Cambridge course – English | 2 | 2 |
| | | Total | 23 | 30 |

| PART | Subject Code | List of courses | Credit | Hours Per Week L/T/P |
|----------|--------------|--|--------|----------------------|
| | | SEMESTER –III | | |
| Part –I | | Tamil/ Malayalam | 3 | 6 |
| Part-II | | English | 3 | 6 |
| Part-III | CC5 | General Chemistry-III | 4 | 4 |
| | CC6 | Qualitative Inorganic analysis of simple salt and Determination of physical constant | 2 | 2P |
| | EC3 | Allied Physics | 4 | 4 |
| | | Allied Physics practical | 2 | 2 |
| Part- IV | SEC-4 | Entrepreneurial skills in Chemistry -Practical | 2 | 2 P |
| | | Naan mudhalvan /* Pesticide Chemistry | 2 | 2 |
| | EVS | Environmental studies | 2 | 2 |
| | | Total | 24 | 30 |
| | | SEMESTER –IV | | |
| Part –I | | Tamil/ Malayalam | 3 | 6 |
| Part-II | | English | 3 | 6 |
| Part-III | CC7 | General Chemistry-IV | 4 | 4 |
| | CC8 | Qualitative Inorganic analysis of mixture of salts | 2 | 2P |
| | EC4 | Allied Physics | 4 | 4 |
| | | Allied Physics practical | 2 | 2 |
| Part- IV | SEC-5 | Instrumental methods of Chemical analysis | 2 | 2 |
| | | Naan mudhalvan / *Forensic science | 2 | 2 |
| | | Value education | 2 | 2 |
| | | Total | 24 | 30 |

| PART | Subject code | List of courses | Credit | Hours Per Week L/T/P |
|----------|---|--|--------|----------------------|
| | | SEMESTER –V | | |
| Part-III | CC9 | Organic Chemistry-1 | 4 | 5 |
| | CC10 | Inorganic Chemistry - I | 4 | 5 |
| | CC11 | Physical Chemistry - I | 4 | 5 |
| | EC5 | Biochemistry / Nanoscience | 3 | 4 |
| | EC6 | Industrial Chemistry/ Pharmaceutical Chemistry | 3 | 4 |
| | CC12 | Project with viva voce | 3 | 5 |
| | | Naan mudhalvan /* Applied Chemistry | 2 | 2 |
| | Internship / industrial or research institute visit/ field visit - 30 hrs | 2 | - | |
| | | Total | 25 | 30 |
| | | SEMESTER –VI | | |
| Part-III | CC13 | Organic Chemistry-II | 3 | 5 |

| | | | | |
|---------|--------------|---|--------|----------------------|
| | CC14 | Inorganic Chemistry - II | 3 | 5 |
| | CC15 | Physical Chemistry -II | 3 | 5 |
| | CC16 | Physical Chemistry practical | 3 | 4P |
| | EC7 | Fundamentals of Spectroscopy / Chemistry in Medicine | 3 | 4 |
| | EC8 | Polymer Science / Agro Chemistry | 3 | 5 |
| Part-IV | | Naan mudhalvan / *Textile Chemistry | 2 | 2 |
| Part -V | | Extension activity –NSS, NCC, YRC, RRC, games and sports/ youth welfare activity | 1 | - |
| | | Total | 21 | 30 |
| | | GENERIC ELECTIVE | | |
| | | CHEMISTRY FOR PHYSICAL SCIENCES I For Mathematics and Physics students Year –I/II | | |
| | Subject code | List of courses | Credit | Hours Per Week L/T/P |
| | | Semester – I/III | | |
| 1 | GE I | Chemistry for Physical sciences- I | 3 | 4L |
| 2 | GE IP | Inorganic volumetric analysis - practical | 2 | 2P |
| | | Semester – II/IV | | |
| 3 | GE II | Chemistry for Physical sciences - II | 3 | 4L |
| 4 | GE IIP | Analysis of organic compounds | 2 | 2P |
| | | CHEMISTRY FOR BIOLOGICAL SCIENCES For Botany and Zoology students Year –I/II | | |
| | | Semester –I/III | | |
| 1 | GE III | Chemistry for Biological sciences- I | 3 | 4L |
| 2 | GE IIIP | Inorganic volumetric analysis - practical | 2 | 2P |
| | | Semester –II/IV | | |
| 3 | GE IV | Chemistry for Biological sciences- II | 3 | 4L |
| 4 | GE IVP | Analysis of organic compounds | 2 | 2P |

1. Credit Distribution for UG Programme in Chemistry

| Sem I | Credit | Sem II | Credit | Sem III | Credit | Sem IV | Credit | Sem V | Credit | Sem V I | Credit |
|--|--------|---|--------|--|--------|---|--------|--|--------|--|--------|
| 1.1. Language | 3 | 2.1. Language | 3 | 3.1. Language | 3 | 4.1. Language | 3 | 5.1. Core Course-CCIX | 4 | 6.1. Core Course-CCXI II | 3 |
| 1.2. English | 3 | 2.2. English | 3 | 3.2. English | 3 | 4.2. English | 3 | 5.2. Core Course-CC X | 4 | 6.2. Core Course-CCX IV | 3 |
| 1.3. Core Course - CC I | 5 | 2.3. Core Course-CC III | 5 | 3.3. Core Course-CC V | 4 | 4.3. Core Course-CC VII | 4 | 5.3. Core Course CCXI | 4 | 6.3. Core Course-CC XV | 3 |
| 1.4. Core Course - CC II | 3 | 2.4. Core Course-CC IV | 3 | 3.4. Core Course-CC VI | 2 | 4.4. Core Course-CC VIII | 2 | 5.4. Core Course- /Project with viva-voce CC-XII | 3 | 6.4. Core Course-CC XVI | 3 |
| 1.5. Elective- I Generic/Discipline Specific | 5 | 2.5. Elective-II Generic/ Discipline Specific | 5 | 3.5. Elective-III Generic/ Discipline Specific | 6 | 4.5. Elective-IV Generic/ Discipline Specific | 6 | 5.5. Elective-V Generic/ Discipline Specific | 3 | 6.5. Elective -VII Generic / Discipline Specific | 3 |
| 1.6. Skill Enhancement Course SEC-1 | 2 | 2.6. Skill Enhancement Course SEC-2 | 1 | 3.6. Skill Enhancement Course SEC-4, (Entrepreneurial Skill) | 2 | 4.6. Skill Enhancement Course SEC-5 | 2 | 5.6. Elective-VI Generic/ Discipline Specific | 3 | 6.6. Elective-VIII Generic/ Discipline Specific | 3 |
| 1.7. Skill Enhancement - (Foundation Course) | 2 | 2.7. Skill Enhancement Course-SEC-3 | 1 | 3.7. Naan mudhalvan | 2 | 4.7. Naan mudhalvan | 2 | 5.7. Naan mudhalvan | 2 | 6.7. Naan mudhalvan | 2 |

| | | | | | | | | | | | |
|--|----|-------------------|----|----------|----|---------|----|---|----|------------------------|----|
| | | 28.Naan mudhalvan | 2 | 3.8. EVS | 2 | 4.8. VE | 2 | 5.8. Summer Internship / Industrial /research institute visit/ field visit/ | 2 | 6.8 Extension Activity | 1 |
| | 23 | | 23 | | 24 | | 24 | | 25 | | 21 |

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

BSc CHEMISTRY PROGRAMME STRUCTURE (2023-2024)

| | Category | Course type | Course code | Course title | Contact Hours/ week | Exam hours | Marks | | | Credit |
|---------|-----------|---------------------------|-------------|---|---------------------|------------|-------|----------|-------|--------|
| | | | | | | | CIA | External | Total | |
| SEM -I | Part -I | Language | | Tamil/ Malayalam | 6 | 3 | 25 | 75 | 100 | 3 |
| | Part -II | Language | | English | 6 | 3 | 25 | 75 | 100 | 3 |
| | Part -III | core | CC1 | General Chemistry-1 | 5 | 3 | 25 | 75 | 100 | 5 |
| | | Core practical | CC2 | Quantitative Inorganic estimation and Inorganic preparation | 3P | 6 | 50 | 50 | 100 | 3 |
| | | Elective | EC1 | Mathematics - /Zoology/ Botany | 6-4 | 3 | 25 | 75 | 100 | 5 |
| | | | | Zoology/Botany practical | 2P | 3 | 50 | 50 | 100 | |
| | Part -IV | Skill enhance ment course | SEC-1 | Food Chemistry / Role of Chemistry in daily life | 2 | 3 | 25 | 75 | 100 | 2 |
| | | Foundati on course | FC | Foundation course in Chemistry/ | 2 | 3 | 25 | 75 | 100 | 2 |
| | | | | Total | 30 | | | | | 23 |
| SEM -II | Part -I | Language | | Tamil/ Malayalam | 6 | 3 | 25 | 75 | 100 | 3 |
| | Part | Language | | English | 4 | 3 | 25 | 75 | 100 | 3 |

| | | | | | | | | | | |
|-----------|---------------------------|-------|---|-----|---|----|----|-----|----|--|
| | -II | | | | | | | | | |
| Part -III | Core | CC3 | General Chemistry-II | 5 | 3 | 25 | 75 | 100 | 5 | |
| | Core practical | CC4 | Qualitative Organic analysis and preparation of Organic compounds | 3P | 6 | 50 | 50 | 100 | 3 | |
| | Elective course | EC2 | Mathematics - Zoology/ Botany | 6-4 | 3 | 25 | 75 | 100 | 5 | |
| | | | Zoology/Botany practical | 2P | 3 | 50 | 50 | 100 | | |
| Part - IV | Skill enhance ment course | SEC-2 | Dairy Chemistry | 2 | 3 | 25 | 75 | 100 | 1 | |
| | | SEC-3 | Cosmetics and personal grooming | 2 | 3 | 25 | 75 | 100 | 1 | |
| | | | Naan Mudhalvan-Cambridge course – English | 2 | - | 25 | 75 | 100 | 2 | |
| | | | Total | 30 | | | | | 23 | |

| SEM-III | Cate gory | Course type | Course code | Course title | Contac t hours/ week | Exa m hours | Marks | | | Credi t |
|-----------|--------------------------------------|-------------|-------------|--|----------------------|-------------|-------|-----------|--------|---------|
| | | | | | | | CI A | Externa l | Tota l | |
| Part -I | Language | | | Tamil/ Malayalam | 6 | 3 | 25 | 75 | 100 | 3 |
| Part- II | Language | | | English | 6 | 3 | 25 | 75 | 100 | 3 |
| Part- III | Core | CC5 | | General Chemistry-III | 4 | 3 | 25 | 75 | 100 | 4 |
| | Core practical | CC6 | | Qualitative Inorganic analysis of simple salt and Determination of physical constant | 2P | 3 | 50 | 50 | 100 | 2 |
| | Generic elective- Allied | EC3 | | Allied Physics | 4 | 3 | 25 | 75 | 100 | 4 |
| | GE | | | Allied Physics practical | 2P | 3 | 50 | 50 | 100 | 2 |
| Part- IV | Skill enhance ment course- practical | SEC-4 | | Entrepreneurial skills in Chemistry - Practical | 2P | 3 | 50 | 50 | 100 | 2 |
| | | | | Naan | 2 | - | 25 | 75 | 100 | 2 |

| | | | | | | | | | | | |
|-------------|--------------|---------------------------------|-------|--|---|----|----|----|-----|-----|---|
| | | | | mudhalvan / *Pesticide Chemistry | | | | | | | |
| | | | EVS | Environmental studies | 2 | 3 | 25 | 75 | 100 | 2 | |
| | | | | Total | 30 | | | | | 24 | |
| SEM - IV | Part -I | Language | | Tamil/ Malayalam | 6 | 3 | 25 | 75 | 100 | 3 | |
| | Part- II | Language | | English | 6 | 3 | 25 | 75 | 100 | 3 | |
| | Part- III | Core | CC7 | | General Chemistry-IV | 4 | 3 | 25 | 75 | 100 | 4 |
| | | Core practical | CC8 | | Qualitative inorganic analysis of mixture of salts | 2P | 3 | 50 | 50 | 100 | 2 |
| | | GE-Allied | EC4 | | Allied Physics | 4 | 3 | 25 | 75 | 100 | 4 |
| | | GE-Allied practical | | | Allied Physics practical | 2P | 3 | 50 | 50 | 100 | 2 |
| | Part- IV | Skill enhanceme nt course | SEC-5 | | Instrumental methods of chemical analysis | 2 | 3 | 25 | 75 | 100 | 2 |
| | | | | | Naan mudhalvan / *Forensic science | 2 | - | 25 | 75 | 100 | 2 |
| | | | | | Value education | 2 | 3 | 25 | 75 | 100 | 2 |
| | | | | Total | 30 | | | | | 24 | |

| Category | Course type | Course code | Course code | Contact Hours/ week | Exam hours | Marks | | | Credit |
|----------|----------------|----------------|---|---------------------------|---------------|-------|----|-----|--------|
| | | | | | | | | | |
| SEM - V | Core | CC9 | Organic Chemistry-1 | 5 | 3 | 25 | 75 | 100 | 4 |
| | Core | CC10 | Inorganic Chemistry - I | 5 | 3 | 25 | 75 | 100 | 4 |
| | Core | CC11 | Physical Chemistry - I | 5 | 3 | 25 | 75 | 100 | 4 |
| | Elective | EC5 | Biochemistry / Nanoscience | 4 | 3 | 25 | 75 | 100 | 3 |
| | Elective | EC6 | Industrial Chemistry/ Pharmaceutical Chemistry | 4 | 3 | 25 | 75 | 100 | 3 |
| | Core | CC12 | Project with viva | 5P | 3 | 50 | 50 | 100 | 3 |

| | | | | | | | | | |
|---------|----------------|------|--|----|---|----|----|-----|----|
| | project | | voce | | | | | | |
| | | | Naan mudhalvan / *Applied Chemistry | 2 | - | 25 | 75 | 100 | 2 |
| | | | Internship / industrial /research institute visit/ field visit-30 hrs | - | 3 | 50 | 50 | 100 | 2 |
| | | | Total | | | | | | 25 |
| SEM- VI | Core | CC13 | Organic Chemistry-II | 5 | 3 | 25 | 75 | 100 | 3 |
| | Core | CC14 | Inorganic Chemistry - II | 5 | 3 | 25 | 75 | 100 | 3 |
| | Core | CC15 | Physical Chemistry - II | 5 | 3 | 25 | 75 | 100 | 3 |
| | Core practical | CC16 | Physical Chemistry practical | 4P | 6 | 50 | 50 | 100 | 3 |
| | Elective | EC7 | Fundamentals of Spectroscopy / Chemistry in Medicine | 4 | 3 | 25 | 75 | 100 | 3 |
| | Elective | EC8 | Polymer science / Agro Chemistry | 5 | 3 | 25 | 75 | 100 | 3 |
| | | | Naan mudhalvan / *Textile chemistry | 2 | - | 25 | 75 | 100 | 2 |
| | | | Extension activity –NSS, NCC, YRC, RRC, games and sports/ youth welfare activity | | | | | | 1 |
| | | | Total | 30 | | | | | 21 |

| GENERIC ELECTIVE | | | | | | | | | | |
|---|-----------|----------------------------|-------------|---------------------------------------|---------------------|------------|-------|----------|-------|--------|
| CHEMISTRY FOR PHYSICAL SCIENCES I For Mathematics and Physics students Year –I/II | | | | | | | | | | |
| | Category | Course type | Course code | Course title | Contact Hours/ week | Exam hours | Marks | | | Credit |
| | | | | | | | CIA | External | total | |
| SEM- I | Part III | Generic elective | GE I | Chemistry for Physical sciences- I | 4 | 3 | 25 | 75 | 100 | 3 |
| | | Generic Elective practical | GE IP | Inorganic volumetric analysis | 2P | 3 | 50 | 50 | 100 | 2 |
| SEM- II | Part –III | Generic elective | GE II | Chemistry for Physical sciences - II | 4 | 3 | 25 | 75 | 100 | 3 |
| | | | GE IIP | Analysis of Organic compounds | 2P | 3 | 50 | 50 | 100 | 2 |
| CHEMISTRY FOR BIOLOGICAL SCIENCES For Botany and Zoology students Year –I/II | | | | | | | | | | |
| SEM - III | Part III | Generic elective | GE III | Chemistry for Biological sciences- I | 4 | 3 | 25 | 75 | 100 | 3 |
| | | Generic Elective practical | GE IIP | Inorganic volumetric analysis - | 2P | 3 | 50 | 50 | 100 | 2 |
| SEM - IV | Part -III | Generic Elective | GE IV | Chemistry for Biological sciences- II | 4 | 3 | 25 | 75 | 100 | 3 |
| | | Generic Elective practical | GE IVP | Analysis of Organic compounds | 2P | 3 | 50 | 50 | 100 | 2 |

EVALUATION SCHEME

- B.Sc Chemistry curriculum is divided into three years and studied in six semesters.
- The internal assessments and external examination are the two parts of evaluation scheme.
- The external theory and practical examinations will be conducted by the university at end of each semester.
- There is a separate passing minimum of 40% for the external and overall components.

**DISTRIBUTION OF MARKS BETWEEN INTERNAL AND EXTERNAL ASSESSMENT FOR CORE,
SKILL ENHANCEMENT,
ELECTIVE, MAJOR ELECTIVE AND ALLIED COURSES.**

* Theory Marks 25: 75

* Practical Marks 50: 50

Pass minimum of 40% for external and overall components.

1. Internal Assessment.

Internal Marks for core theory shall be allotted in the following manner

| | |
|---|----------|
| The average of the best two tests from three compulsory tests. Each test is of one hour duration | 20 marks |
| Assignment | 05 marks |
| Total | 25 Marks |

Distribution of marks between Internal and

External Assessment for skill enhancement / elective Course- 25: 75

| | |
|---|----------|
| The average of the best two from three compulsory tests. (Each test is of one hour duration) | 20 marks |
| Assignment | 05 marks |
| Total | 25 marks |

2. Internal Marks for Practical shall be allotted in the following manner

Experiments (a minimum of six experiments) done in the class alone should be recorded.

Students having a bonafide record only should be permitted to appear for the practical examination.

| | |
|-------------------|----------|
| Experimental work | 25 marks |
| Regularity | 25 marks |
| Total | 50 marks |

3. Marks for Major Project and viva-voce shall be allotted in the following manner

Group project: maximum of five students per group.

Internal Marks : 50 ; External Marks: 50

Internal Marks for Project:

| | |
|-------------------|----------|
| Experimental work | 25 marks |
| Project report | 25 marks |
| Total | 50 marks |

External evaluation of Project;

Project report evaluation and Viva-Voce will be conducted by both the External examiner and the Guide at the end of the semester.

4. Internship

Report for Internship / Industrial Visit / Field Visit / Research Institute Visit,

Should be evaluated along with the project at the end of Vth semester.

Students should submit a report for internship / industrial visit / field visit / research institute visit at the end of fifth semester with attendance certificate from the concern organisation.

The duration of internship should be 30 hours.

Internal:50 marks; External: 50 marks

5. Extension Activity:

The student should participate in any one of the programme like NSS, NCC, YRC, RRC, games and sports/ youth welfare activity, outreach programmes etc. the examination / report / evaluation will be conducted at the end of sixth semester.

6. Naan mudhalvan programme is compulsory for all the students. Those who failed in naan mudhalvan can write exam for the substitute subject*

7. The question pattern for all theory courses shall be as follows.

Duration of Exam: 3 Hours

| Section | Type of questions | Mark Distribution |
|--------------|---|-------------------|
| Part A | Multiple choice question (Two question from each unit compulsory) | 10x1=10 Marks |
| Part B | Internal Choice questions (One question from each unit: either/or choice) | 5x5=25 marks |
| Part C | Internal Choice questions (One question from each unit: either/or choice) | 5x8=40 marks |
| Total | | 75 Marks |

| | | | | | | | |
|-------------------------------------|---|-----------------|--------------------|----------------|--------------|--------------------|--|
| Title of the Course | GENERAL CHEMISTRY-I | | | | | | |
| Paper No. | Core-I | | | | | | |
| Category | Core | Year | I | Credits | 5 | Course Code | |
| | | Semester | I | | | | |
| Instructional Hours per week | Lecture | Tutorial | LabPractice | | Total | | |
| | 4 | 1 | - | | 5 | | |
| Pre requisites | Higher secondary chemistry | | | | | | |
| Objectives of the course | <p>The course aims at giving an overall view of the</p> <ul style="list-style-type: none"> • Various atomic models and atomic structure • Wave particle duality of matter • periodictable, periodicity in properties and its application in explaining the chemical behaviour • nature of chemical bonding ,and • fundamental concepts of organic chemistry. | | | | | | |
| Course Outline | <p>UNIT-I</p> <p>Atomic structure and Periodic trends</p> <p>History of atom (J.J. Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory- Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength- Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli's exclusion principle and Aufbau principle;</p> <p>Numerical problem involving the core concepts.</p> | | | | | | |

| | |
|--|---|
| | <p>Unit-II</p> <p>Introduction to Quantum mechanics Classical mechanics, wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of Schrodinger wave equation- Probability and electron density-visualizing the orbitals –Probability density and significance of Ψ and Ψ^2.</p> <p>Modern Periodic Table</p> <p>Cause of periodicity; Features of the periodic table; classification of elements- Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.</p> <p>Problems involving the core concepts.</p> |
| | <p>UNIT-III</p> <p>Structure and bonding -I</p> <p>Ionic bond</p> <p>Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and salvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules- effects of polarisation on properties of compounds; problems involving the core concepts.</p> <p>Covalent bond</p> <p>Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB₂, AB₃, AB₄, AB₅, AB₆ and AB₇</p> <p>Partial ionic character of covalent bond-dipole moment, application to molecules of the type A₂, AB, AB₂, AB₃, AB₄; percentage ionic character- numerical problems based on calculation of percentage ionic character.</p> |

UNIT-IV**Structure and bonding -II**

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO₂, NO₂, CO₃²⁻, NO₃⁻; limitations of VBT; MO theory-bonding, antibonding and nonbonding

orbitals, bond order; MO diagrams of H₂, C₂, O₂, O₂⁺, O₂²⁻, O₂⁻, N₂, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of BF₃, NH₃, NH₄⁺, H₃O⁺ properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor-types, applications of semiconductors

Weak Chemical Forces-Vander Waals forces, ion- dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding-Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V**Basic concepts in Organic Chemistry and Electronic effects**

Types of bond cleavage-heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates- carbanions, carbocations, carbenes, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance-resonance energy, conditions for resonance-acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free

radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.

Hyper conjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitro methane

Types of organic reactions- addition, substitution, elimination and rearrangements

| | |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. Madan, R.D. and Sathya Prakash, <i>Modern Inorganic Chemistry</i>, 2nded.; S. Chand and Company: New Delhi, 2003. 2. Rao, C.N.R. <i>University General Chemistry</i>, Macmillan Publication: New Delhi, 2000. 3. Puri, B.R. and Sharma, L.R. <i>Principles of Physical Chemistry</i>, 38thed.; Vishal Publishing Company: Jalandhar, 2002. 4. Bruce, P.Y. and Prasad K.J.R. <i>Essential of Organic Chemistry</i>, Pearson Education: New Delhi, 2008. 5. Dash UN, Dharmarha OP, Soni P.L. <i>Textbook of Physical Chemistry</i>, SultanChand&Sons:NewDelhi, 2016 |
| Reference Books | <ol style="list-style-type: none"> 1. Maron, S.H. and Prutton C.P. <i>Principles of Physical Chemistry</i>, 4thed.; The Macmillan Company: New York, 1972. 2. Lee, J.D. <i>Concise Inorganic Chemistry</i>, 4th ed.; ELBS William Heinemann: London, 1991. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26thed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. <i>Physical Chemistry</i>, 10thed.; Oxford University Press: New York, 2014. 5. Huheey, J.E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, 4thed.; Addison, Wesley Publishing Company: India, 1993. |
| Website and e-learning source | <ol style="list-style-type: none"> 1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/ |
| | |

Course Learning Outcomes (for Mapping with POs and PSOs)**On completion of the course the students should be able to****CO1:** explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.**CO2:** classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.**CO3:** apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electronegativity, percentage ionic character and bond order.**CO4:** evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects**CO5:** construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H-bonding and organic reaction mechanisms.

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

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

Level of Correlation between PSO's and CO'

| | | | | | | |
|-------------------------------------|---|-----------------|---------------------|----------------|--------------|--------------------|
| Title of the Course | Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations | | | | | |
| Paper No. | Core -II | | | | | |
| Category | Core | Year | I | Credits | 2 | Course Code |
| | | Semester | I | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | - | - | 3 | | 3 | |
| Pre requisites | Higher secondary chemistry | | | | | |
| Objectives of the course | <p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • laboratory safety • handling glass wares • Quantitative estimation • Preparation of inorganic compounds. | | | | | |
| Course Outline | Unit-I | | | | | |
| | <p>Chemical Laboratory Safety in Academic Institutions</p> <p>Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.</p> <p>Common Apparatus Used in Quantitative Estimation (Volumetric)</p> <p>Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.</p> <p>Principle of Quantitative Estimation (Volumetric)</p> <p>Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.</p> | | | | | |
| | <p>Unit - II</p> <p>Quantitative Estimation (Volumetric)</p> <p>Preparation of standard solution, dilution from stock solution</p> <p>Permanganometry</p> <p>Estimation of sodium oxalate using standard ferrous ammonium sulphate</p> | | | | | |

| | |
|---|---|
| | <p>Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator)</p> <p>Iodometry Estimation of copper in copper sulphate using standard dichromate</p> <p>Argentimetry Estimation of chloride in barium chloride using standard sodium chloride / Estimation of chloride in sodium chloride (Volhard's method)</p> |
| | <p>Unit -III Complexometry Estimation of hardness of water using EDTA</p> <p>Estimations Estimation of iron in iron tablets Estimation of ascorbic acid.</p> <p>Preparation of Inorganic compounds- Potash alum Tetraamminecopper (II) sulphate Hexamine cobalt (III) chloride Mohr's Salt</p> |
| Skills acquired From this course | Knowledge, Problemsolving, Analyticalability,Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. <i>Basic Principles of Practical Chemistry</i>, 2nded.; Sultan Chand & Sons: New Delhi, 1997. 2. Nad, A.K.; Mahapatra, B.; Ghoshal, A.; <i>An advanced course in Practical Chemistry</i>, 3rded.; New Central Book Agency: Kolkata, 2007. |
| Reference Books | 1. Mendham, J.; Denney, R.C.; Barnes, J.D.; Thomas, M.; Sivasankar, B.; <i>Vogel's Textbook of Quantitative Chemical Analysis</i> , 6 th ed.; Pearson Education Ltd: New Delhi, 2000. |
| Website and e-learning source | <p>Web References:</p> <ol style="list-style-type: none"> 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis 2) https://chemdictionary.org/titration-indicator/ |
| <p>Course Learning Outcomes (for Mapping with Pos and PSOs)</p> <p>On successful completion of the course the students should be able to</p> <p>CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.</p> <p>CO2: compare the methodologies of different titrimetric analysis.</p> <p>CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.</p> <p>CO4: assess the yield of different inorganic preparations and identify the end point of various titrations.</p> | |

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

CO-PO Mapping (Course Articulation Matrix)

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

| Title of the Course | FOOD CHEMISTRY | | | | | |
|------------------------------|--|----------|--------------|---------|-------|-------------|
| Paper No. | SEC-I | | | | | |
| Category | NME | Year | I | Credits | 2 | Course Code |
| | | Semester | I | | | |
| Instructional hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 2 | - | - | | 2 | |
| Prerequisites | Higher secondary Chemistry | | | | | |
| Objectives of the course | This course aims at giving an overall view of the <ul style="list-style-type: none"> • Types of food. • Food adulteration and poisons. • Food additives and preservation. | | | | | |

| | |
|-------------------------|---|
| Course Outline | <p>UNIT-I</p> <p>Food Adulteration Sources of food, types, advantages and disadvantages. Food adulteration-contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals - Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.</p> |
| | <p>Unit –II</p> <p>Food Poison Food poisons-natural poisons(alkaloids-nephrotoxin)-pesticides,(DDT, BHC, Malathion)- Chemical poisons-First aid for poison consumed victims.</p> <p>UNIT-III</p> <p>Food Additives Food additives-artificial sweeteners–Saccharin-Cyclamate and Aspartate Food flavours- esters, aldehydes and heterocyclic compounds–Food colours – Emulsifying agents–preservatives-leavening agents. Baking powder–yeast–tastemakers–MSG- vinegar.</p> <p>UNIT-IV</p> <p>Beverages Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addiction to alcohol– diseases of liver and social problems.</p> <p>UNIT-V</p> <p>Edible Oils Fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats-iodine value-role of MUFA and PUFA in preventing heart diseases-determination of iodine value, RM value, saponification values and their significance.</p> |
| Recommended Text | <ol style="list-style-type: none"> 1. Food chemistry, H.K. Chopra, P.S. Panesar, Narosa publishing house, 2010. 2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S.Chand & Co.Publishers, second edition, 2006. 3. Food chemistry, H.K. Chopra, P.S. Panesar, Narosa publishing house, 2010. 4. Food Chemistry, Dr.L. Rakesh Sharma, Evince publishing, 2022. 5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Padmini S Ghugre, New age international publishers, second edition, 2021. |

| | |
|---|---|
| Reference Books | <ol style="list-style-type: none"> 1. H.-D.Belitz, Werner Grosch, Food Chemistry Springer Science& Business Media, 4th Edition, 2009. 2. M. Swaminathan, Food Science and Experimental Foods, Ganesh and Company, 1979. 3. Hasenhuettl, Gerard.L.; Hartel, Richard.W. Food Emulsifiers and their applications Springer New York 2nd ed. 2008. 4. Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourth revised and extended edition, 2009. 5. Principles of food chemistry ,John M. deMan, John W.Finley, W.Jefferey Hurst, Chang YongLee, Springer, Fourth edition, 2018. |
| Web site and e-learning source | |
| Course Learning Outcomes (for Mapping with POs and PSOs) | |
| On completion of the course the students should be able to | |
| CO1: learn about Food adulteration-contamination of Wheat, Rice, Milk, Butter. | |
| CO2: get an awareness about food poisons like natural poisons (alkaloids- nephrotoxin) pesticides, DDT, BHC, Malathion | |
| CO3: get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and Aspartate in the food industries. | |
| CO4: acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples. | |
| CO5: study about fats and oils-Sources of oils-production of refined vegetable oils- preservation. Saturated and unsaturated fats –MUFA and PUFA | |

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|---|--|-----------------|---------------------|----------------|--------------|--------------------|--|
| Title of the Course | ROLE OF CHEMISTRY IN DAILY LIFE | | | | | | |
| Paper No. | SEC-I | | | | | | |
| Category | NME | Year | I | Credits | 2 | Course Code | |
| | | Semester | I | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 2 | - | - | | 2 | | |
| Prerequisites | Higher secondary chemistry | | | | | | |
| Objectives of the course | <p>This course aims at providing an overall view of the</p> <ul style="list-style-type: none"> • Importance of Chemistry in every day life • Chemistry of building materials and food • Chemistry of Drugs and pharmaceuticals | | | | | | |
| Course Outline | UNIT-I | | | | | | |
| | General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution | | | | | | |
| | Unit-II | | | | | | |
| | Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins-preparation and uses only. | | | | | | |
| | UNIT-III | | | | | | |
| Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins(sources and their physiological importance).Cosmetics–tooth paste,facepowder,soapsanddetergents,shampoos,nailpolish,perfumes- general formulation and preparations – possible hazards of cosmetic use. | | | | | | | |
| UNIT-IV | | | | | | | |
| Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel–classification-solid, liquid and gaseous; nuclear fuel examples and uses. | | | | | | | |
| UNIT-V | | | | | | | |
| Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals –pigments and dyes-examples and applications. Explosives - classification and examples. | | | | | | | |

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| Recommended Text | <ol style="list-style-type: none"> 1. Food chemistry, H.K.Chopra, P.S.Panesar, Narosa publishing house, 2010. 2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012. 3. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 4. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019. 5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006. |
| Reference Books | <ol style="list-style-type: none"> 1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourth edition, 1977. 2. W.A. Poucher, Joseph A. Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000. 3. A.K.De, Environmental Chemistry, New Age International Public Co., 1990. |
| Website and e-learning source | |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO1: learn about the chemicals used in everyday life as well as air pollution and water pollution.</p> <p>CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters.</p> <p>CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats, also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.</p> <p>CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classifications, liquid and gaseous; nuclear fuel-examples and uses.</p> <p>CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.</p> | |

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| Title of the Course | GENERAL CHEMISTRY-II | | | | | |
|------------------------------|---|----------|--------------|---------|-------|-------------|
| Paper No. | Core – III | | | | | |
| Category | Core | Year | I | Credits | 5 | Course Code |
| | | Semester | II | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | 1 | - | | 5 | |
| Pre requisites | General Chemistry –I | | | | | |
| Objectives of the course | This course aims at providing an over all view of the <ul style="list-style-type: none"> • Chemistry of acids, bases and ionic equilibrium • properties of s- and p-block elements • chemistry of hydrocarbons • applications of acids and bases • compounds of main block elements and hydrocarbons | | | | | |

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| Course Outline | UNIT-I Acids, bases and Ionic equilibria Concepts of Acids and Bases –Arrhenius concept, Bronsted-Lowry concept, |
| | Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis – salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis; Solubility product – determination and applications; numerical problems Involving the core concepts. |
| | Unit – II Chemistry of s – Block Elements Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na ₂ CO ₃ , KBr, KClO ₃ alkaline earth metals. Anomalous behaviour of Be. Chemistry of p – Block Elements (Group 13 & 14) Preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. Comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates. |
| | UNIT-III Chemistry of p – Block Elements (Group 15-18) General characteristics of elements of Group 15; chemistry of H ₂ N-NH ₂ , NH ₂ OH, HN ₃ and HNO ₃ . Chemistry of PH ₃ , PCl ₃ , PCl ₅ , POCl ₃ , P ₂ O ₅ and oxyacids of phosphorous (H ₃ PO ₃ and H ₃ PO ₄). General properties of elements of group 16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxyacids of sulphur (Caro's and Marshall's acids). |

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| | <p>Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxyacids (HClO₄). Inter-halogen compounds (ICl, ClF₃, BrF₅ and IF₇), pseudo halogens [(CN)₂ and (SCN)₂] and basic nature of Iodine.</p> <p>Noble gases: Position in the periodic table. Preparation, properties and Structure of XeF₂, XeF₄, XeF₆ and XeOF₄; uses of noble gases - clathrate compounds.</p> |
| | <p>UNIT – IV</p> <p>Hydrocarbon Chemistry-I Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses</p> <p>Alkenes-Nomenclature, general methods of preparation – Mechanism of β-elimination reactions – E₁ and E₂ mechanism – factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.</p> <p>Alkadienes Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes-1,2 and 1,4 additions; free radical addition to conjugated dienes – Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.</p> <p>Alkynes Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerization and isomerisation.</p> <p>Cyclo alkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.</p> |

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| | <p>UNIT-V Hydrocarbon Chemistry-II Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene-Effect of substituent – orientation and reactivity. Polynuclear Aromatic hydrocarbons: Naphthalene–nomenclature, Haworth synthesis; physical properties, reactions–electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel–Crafts acylation & alkylation, preferential substitution at β-position – reduction, oxidation–uses. Anthracene – synthesis by Elbs reaction, Diels –Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.</p> |
| Extended Professional Component (is a Part of internal | Questions related to the above topics, from various competitive examinations UPSC/JAM/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 | <ol style="list-style-type: none"> 1. Madan .R.D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded, S.Chand and Company, New Delhi. 2. Sathya Prakash, Tuli G D, Basu S K and Madan R.D, (2003), Advanced Inorganic Chemistry, 17th ed., S. Chand and Company, New Delhi. 3. Bahl B.S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rded., S.Chand and Company, New Delhi. 4. Tewari .K. S, Mehrothra .S. N and Vishnoi .N .K, (1998), Text book of Organic Chemistry, 2nded, Vikas Publishing House, New Delhi. 5. Puri B. R, Sharma .L. R, (2002), Principles of Physical Chemistry, 38thed., Vishal Publishing Company, Jalandhar. |

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| Reference Books | <p>Maron .S. H and Prutton C P, (1972), Principles of Physical Chemistry, 4thed., The Macmillan Company, Newyork.</p> <p>Barrow G M, (1992), Physical Chemistry, 5thed., Tata McGraw Hill, New Delhi.</p> <p>Lee .J. D,(1991),ConciseInorganicChemistry,4thed.,ELBSWilliam Heinemann, London.</p> <p>Huheey. J.E,(1993),InorganicChemistry:PrinciplesofStructureand Reactivity, 4thed., Addison Wesley Publishing Company, India.</p> <p>Gurudeep Raj,(2001),AdvancedInorganicChemistryVol-I,26thed., Goel Publishing House, Meerut.</p> <p>Agarwal.O.P,(1995),ReactionsandReagentsinOrganicChemistry, 8thed., Goel Publishing House,Meerut.</p> |
| Website and e-learning source | <p>https://onlinecourses.nptel.ac.in/http://cactus.dixie.edu/sblack/chem1010/lecture notes/4B.html</p> <p>http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atOMIC-structure-and-chemical-bonding</p> <p>MOOCcomponents</p> <p>http://nptel.ac.in/courses/104101090/</p> <p>Lecture 1: Classification of elements and periodic properties</p> <p>http://nptel.ac.in/courses/104101090/</p> |

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

- CO1:** explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons
- CO2:** discuss the periodic properties of s and p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids
- CO3:** classify hydrocarbons, types of reactions, acids and bases, examine the properties of s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons
- CO4:** explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements
- CO5:** assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|-------------------------------------|--|-----------------|---------------------|----------------|--------------|--------------------|--|
| Title of the Course | QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS | | | | | | |
| Paper No. | Core - IV | | | | | | |
| Category | Core | Year | I | Credits | 2 | Course Code | |
| | | Semester | II | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | - | - | 3 | | 3 | | |
| Pre requisites | General Chemistry - II | | | | | | |
| Objectives of the course | <p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • Laboratory safety • Handling glass wares • Analysis of organic compounds • Preparation of organic compounds | | | | | | |
| Course Outline | UNIT - I | | | | | | |
| | <p>Safety rules, symbols and first – aid in chemistry laboratory. Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware – basis information and uses.</p> | | | | | | |
| | Unit - II | | | | | | |
| | <p>Qualitative Organic Analysis Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups</p> <ul style="list-style-type: none"> • Monocarboxylic acid, dicarboxylic acid • Monohydric phenol, polyhydric phenol • Aldehyde ,ketone, ester • Carbohydrate (reducing and non – reducing sugars) • primary, secondary, tertiary amine • monoamide, diamide, thioamide • anilide, nitro compound • Preparation of derivatives fo rfunctional groups | | | | | | |

UNIT - III

Preparation of Organic Compounds

- i. Nitration-picric acid from Phenol
- ii. Halogenation-p-bromo acetanilide from acetanilide
- iii. Oxidation-benzoic acid from Benzaldehyde
- iv. Microwave assisted reactions in water:
 - v. Methyl benzoate to Benzoic acid
 - vi. Salicylic acid from Methyl Salicylate
- vii. Rearrangement- Benzil to Benzilic Acid
- viii. Hydrolysis of benzamide to Benzoic Acid

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| | <p>Separation and Purification Techniques (Not for Examination)</p> <ol style="list-style-type: none"> 1. Purification of organic compounds by crystallization (from water / alcohol) and distillation 2. Determination of melting and boiling points of organic compounds. 3. Steam distillation – Extraction of essential oil from citrus fruits / eucalyptus leaves. 4. Chromatography (anyone) (Group experiment) <ol style="list-style-type: none"> (i) Separation of amino acids by Paper Chromatography. (ii) Thin Layer Chromatography-mixture of sugars / plant pigments / permanganate dichromate. Column Chromatography - extraction of carotene, chlorophyll and xanthophylls from leaves/ separation of anthracene - anthracene picrate. 5. Electrophoresis – Separation of amino acids and proteins. (Demonstration) 6. Isolation of casein from milk / Determination of saponification value of oil or fat / Estimation of acetic acid from commercial vinegar. (Anyone Group experiment) (4,5& 6–not for ESE) |
| | <ol style="list-style-type: none"> 1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. <i>Basic Principles of Practical Chemistry</i>, 2nded.; Sultan Chand: New Delhi, 2012. 2. Manna, A.K. <i>Practical Organic Chemistry</i>, Books and Allied: India, 2018. 3. Gurtu, J.N; Kapoor, R. <i>Advanced Experimental Chemistry (Organic)</i>, Sultan Chand: New Delhi, 1987. 4. Furniss, B.S.; Hanna ford, A.J.; Smith, P.W.G.; Tatchell, A.R. <i>Vogel's Textbook of Practical Organic Chemistry</i>, 5thed.; Pearson: India, 1989. |
| <p>Website and e-learning source</p> | <p>https://www.vlab.co.in/broad-area-chemical-sciences</p> |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

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

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

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

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

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| Title of the Course | DAIRY CHEMISTRY | | | | | | |
|---|---|----------|--------------|---------|-------|-------------|--|
| Paper No. | SEC-II | | | | | | |
| Category | NME | Year | I | Credits | 2 | Course Code | |
| | | Semester | II | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 2 | - | - | | 2 | | |
| Prerequisites | Higher secondary chemistry | | | | | | |
| Objectives of the course | <p>This course aims at providing an overall view of the</p> <ul style="list-style-type: none"> • Chemistry of milk and milk products • Processing of milk • Preservation and formation of milk products. | | | | | | |
| Course Outline | <p>UNIT – I</p> <p>Composition of Milk Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals-physical properties of milk- colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk-adulterants, preservatives with neutralizer- Examples and their detection- estimation of fat, acidity and total solids in milk.</p> | | | | | | |
| | <p>Unit -II</p> <p>Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico - chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization– Ultra High Temperature Pasteurization.</p> | | | | | | |
| | <p>UNIT – III</p> <p>Major Milk Products Cream - definition - composition - chemistry of creaming process – gravitational and centrifugal methods of separation of cream – estimation of fat in cream. Butter-definition - composition - theory of churning – desi butter- salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents- common adulterants added to ghee and their detection - rancidity - definition - prevention-antioxidants and synergists-natural and synthetic.</p> | | | | | | |
| | <p>UNIT-IV</p> <p>Special Milk Standardised milk-definition-merits-reconstituted milk-definition-flow diagram of manufacture-Homogenised milk-flavoured milk-vitaminised milk –toned milk –Incitation milk -Vegetable toned milk- humanized milk-</p> | | | | | | |
| Condensed milk-definition, composition and nutritive value. | | | | | | | |

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| | <p>UNIT- V</p> <p>Fermented and other Milk Products</p> <p>Fermented milk products– fermentation of milk - definition, conditions, cultured milk-definition of culture-example, conditions-cultured cream, buttermilk- Bulgarian milk – acidophilous milk–Yoheer Indigeneous products-khoa and chhena definition-Ice cream-definition-percentage composition-types-ingredients-manufacture of ice-cream, stabilizers - emulsifiers and their role – milk powder- definition-need for making milk powder- drying process-types of drying.</p> |
| Recommended Text | <ol style="list-style-type: none"> 1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition, 2006. 2. K.S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia Publishing House New Delhi, 1974. 3. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, Indian Council of Agricultural Research, 1 st edition, 2008. 4. A Textbook of dairy chemistry, Saurav Singh, Daya Publishing house, 1st edition, 2013. 5. Text book of dairy chemistry, P.L. Choudhary, Bio-Green book publishers, 2021. |
| Reference Books | <ol style="list-style-type: none"> 1. Robert Jenness and S.Patom, Principles of Dairy Chemistry, S. Wiley, New York, 2005. 2. F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore, 2006. 3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, New Delhi, 1980. 4. P.F. Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry, Springer, Second edition, 2016. 5. Dairy chemistry and biochemistry, P.F. Fox, T. Uniacke - Lowe, P.L.H. Mc Sweeney, J.A.O. Mahony, Springer, Second edition, 2015. |
| Website and e-learning source | |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: understand about general composition of milk- constituents and its physical properties.

CO 2: acquire knowledge about pasteurization of Milk and various types of pasteurization - Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO3: learn about Cream and Butter their composition and how to estimate fat in cream and Ghee.

CO4: explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO5: have an idea about how to make milk powder and its drying process – types of drying process.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| Title of the Course | COSMETICS AND PERSONAL GROOMING | | | | | |
|---------------------|---------------------------------|----------|--------------|---------|-------|-------------|
| Paper No. | SEC- III (Discipline Specific) | | | | | |
| Category | SEC | Year | I | Credits | 2 | Course Code |
| | | Semester | I/II | | | |
| Instructional | Lecture | Tutorial | Lab Practice | | Total | |
| Hours per week | 2 | - | - | | 2 | |

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|---------------------------------|---|
| Pre requisites | Higher secondary Chemistry |
| Objectives of the course | This course aims at familiarizing the students with <ul style="list-style-type: none"> • Formulations of various types of cosmetics and their significance • hair, skin and dental care • makeup preparations and personal grooming |
| Course Outline | Unit-I Skin care Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics–key ingredients, skin lightness, depilatories. |
| | Unit - II Haircare Shampoos–types– powder, cream, liquid, gel–ingredients; conditioner– types– ingredients Dental care Tooth pastes – ingredients – mouthwash |
| | Unit - III Makeup Base – foundation – types –ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge |
| | Unit - IV Perfumes Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gris from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – Esters – alcohols – aldehydes – ketones |
| | Unit -V Beauty treatments Facials-types–advantages – disadvantages; facemasks – types; bleach- types– advantages – disadvantages; shaping the brows; eyelash tinting; perming – types; hair colouring and dyeing; permanent waving – hair straightening; wax – types – waxing; pedicure, manicure – advantages – disadvantages. |
| Recommended Text | 1. Thankamma Jacob, (1997) Foods, drugs and cosmetics – A consumer guide, Macmillan publication, London. |
| Reference Books | 1. Wilkinson, JBE, and Moore,RJ,(1997) Harry’s cosmeticology, 7 th ed., Chemical Publishers, London. 2. George Howard, (1987) Principles and practice of perfumes and cosmetics, |

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| | Stanley Therones, Chettenham |
| Website and e-learning source | 1. http://www.khake.com/page75.html 2. Net. foxsm/list/284 |
| Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to <ul style="list-style-type: none"> • CO1: know about the composition of various cosmetic products. • CO2: understand chemical aspects and applications of hair care and dental care and skin care products. • CO3: understand chemical aspects and applications of perfumes and skin care products. • CO4: to understand the methods of beauty treatments their advantages and disadvantage • CO5: understand the hazards of cosmetic products. | |

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|-------------------------------------|---|-----------------|---------------------|----------------|---|--------------------|--|
| Title of the Course | GENERAL CHEMISTRY-III | | | | | | |
| Paper No. | Core –V | | | | | | |
| Category | Core | Year | II | Credits | 5 | Course Code | |
| | | Semester | III | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | | Total | |
| | 4 | | - | | | 4 | |
| Pre requisites | General Chemistry–I and II | | | | | | |
| Objectives of the course | <p>This course aims to provide a comprehensive knowledge on</p> <ul style="list-style-type: none"> • The physical properties of gases, liquids, solids and X-ray diffraction of solids. • Fundamentals of nuclear chemistry and nuclear waste management. • Applications of nuclear energy • Basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. • Preparation and properties of phenols and alcohols. | | | | | | |
| Course Outline | <p>UNIT I</p> <p>Gaseous state</p> <p>Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.</p> <p>Real gases: Deviations from ideal gas behaviour, (Andrew’s and Amagat’s plots); compressibility factor, Z and its variation with pressure for different gases. Equations of states for real gases –Vander Waal’s equation; Virial equation; Boyle temperature; Numerical problems based on equations of states for real gases, isotherms of real gases–critical phenomena–isotherms of CO₂</p> <p>-continuity of state –Van der waal’s equation and the critical state; law of corresponding states- liquefaction of gases; numerical problems involving the core concepts.</p> | | | | | | |

Unit-II**Liquid and Solid State**

Properties of Liquids-Surface tension, viscosity and their applications. Crystalline and amorphous- differences-geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.

Crystals-size and shape; laws of crystallography; symmetry elements - planeCentre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X - ray diffraction - Bragg's equation, Packing in atomic solids - simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO₂; comparison of structure and properties of diamond and graphite;. Numerical problems involving core concepts

Defects in solids- stoichiometric and non stoichiometric defects

Liquid crystals-classification and applications

. UNIT-III**Nuclear Chemistry**

Natural radioactivity - α , β and γ rays; half-life period; Fajan-Soddy group displacement law; Geiger-Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units - Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series.

Isotopes - uses - tracers - determination of age of rocks by radiocarbon dating. (Problems to be worked out)

Nuclear energy; nuclear fission and fusion-major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures.

UNIT-IV**Halogen derivatives Aliphatic halogen derivatives**

Nomenclature and classes of alkyl halides - isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions - SN₁, SN₂ and SN_i mechanisms with stereochemical aspects and effect of solvent.

. Di, Tri & Tetra Halogen derivatives: Nomenclature, classification, preparation, properties and applications

Aromatic halogen compounds

Nomenclature, preparation, properties and uses

Mechanism of nucleophilic aromatic substitution - benzyne intermediate.

Aryl alkyl halides

Nomenclature, benzyl chloride - preparation - properties and uses

Alcohols: Nomenclature, classification, preparation, properties, use; conversions- ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetra acetate.

UNIT-V**Phenols**

Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions–Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction.

Resorcinol, quinol, picric acid –preparation, properties and uses.

Aromatic alcohols

Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation–substitution on the benzene nucleus, uses.

Thiols: Nomenclature, structure, preparation and properties.

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| ded Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. B.R.Puri, L.R.Sharma, M.S.Pathania; <i>Principles of Physical Chemistry</i>, 46thedition, Vishal Publishing, 2020. 2. B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i>, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009. 3. P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, Sultan Chand & amp; Sons, twentieth edition, 2006. 4. M.K. ain, S.C. Sharma, <i>Modern Organic Chemistry</i>, Vishal Publishing, fourth reprint,2003. 5. S.M. Mukherji, and S.P. Singh, <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., third edition, 1994. |
| Reference Books | <ol style="list-style-type: none"> 1. T.W. Graham Solomons, <i>Organic Chemistry</i>, John Wiley & amp; Sons, fifth edition, 1992. 2. A. Carey Francis, <i>Organic Chemistry</i>, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, seventh edition, 2009. 3. I. L. Finar, <i>Organic Chemistry</i>, Wesley Longman Ltd, England, sixth edition, 1996. 4. P. L. Soni, and H. M.Chawla - <i>Text Book of Organic Chemistry</i>, New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007. 5.J.D. Lee, <i>Concise Inorganic Chemistry</i>, Blackwell Science, fifth edition, 2005. |
| Website and e-learning source | MOOC components https://nptel.ac.in/courses/104104101 Solid state chemistry https://nptel.ac.in/courses/103106071 Nuclear industries and safety https://nptel.ac.in/courses/104106119s Introduction to organic chemistry |

Course Learning Outcomes (for Mapping with PO's and PSO's)

On completion of the course the students should be able to

CO1: Explain the kinetic properties of gases by using mathematical concepts.

CO2: Describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.

CO3: Investigate the radioactivity, nuclear energy and its production, also the nuclear waste management.

CO4: Write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.

CO5: Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | |
|--|---|-----------------|---------------------|----------------|--------------|--------------------|
| Title of the Course | QUALITATIVE INORGANIC ANALYSIS OF SIMPLE SALT AND DETERMINATION OF PHYSICAL CONSTANT | | | | | |
| Paper No. | Core- VI | | | | | |
| Category | Core | Year | II | Credits | 2 | Course Code |
| | | Semester | III | | | |
| Instructional hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | - | - | 2 | | 2 | |
| Pre requisites | General Chemistry | | | | | |
| Objectives of the course | To develop the skill on systematic analysis of simple Inorganic salts To determine the melting and boiling point of the Organic substance/ solvent. To study the principle of the experiments. | | | | | |
| Course Outline | Semi-Micro Qualitative Analysis <ol style="list-style-type: none"> 1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, chloride, bromide, iodide, nitrate. 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate. 3. Elimination of interfering acid radicals and identifying the group of basic radicals. 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, iron, aluminium, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium. 5. Determination of melting point and boiling point of the given organic substance /solvent. | | | | | |
| Skills acquired from this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. | | | | | |
| Recommended Text | Reference Books: V. Venkateswaran, R. Veera swamy and A.R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997. | | | | | |
| Website and e-learning source | https://www.vlab.co.in/broad-area-chemical-sciences | | | | | |
| Course Learning Outcomes (for Mapping with POs and PSOs) | | | | | | |
| On successful completion of the course the students should be able to CO1: acquire knowledge on the systematic analysis of simple salts. CO 2: identify the cations and anions in the unknown substance. CO3: identify the cations and anions in the soil and water and to test the quality of water. CO4: assess the role of common ion effect and solubility product | | | | | | |

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|------------------------------------|---|----------------------|---------------------|----------------|---|--------------------|--|
| Title of the Course | ENTREPRENEURIAL SKILLS IN CHEMISTRY | | | | | | |
| Paper No. | SEC IV | | | | | | |
| Category | Skill Enhancement Course | Year Semester | II III | Credits | 2 | Course Code | |
| Instructional Hours perweek | Lecture | Tutorial | Lab Practice | | | Total | |
| | - | - | 2 | | | 2 | |
| Pre requisites | General Chemistry | | | | | | |
| Objectives of the course | <p>The course aims at providing training to</p> <ul style="list-style-type: none"> • Develop entrepreneurial skills in students • To provide hands on experience to prepare and develop products • Develop start ups | | | | | | |
| Course Outline | <p>UNIT-I</p> <p>Food Chemistry Food adulteration – contamination of food items with clay stones, water and toxic chemicals -Common adulterants. Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect), food colourants, Preservatives, leavening agents, Baking powder and baking soda, yeast, MSG, vinegar.</p> <p>Dyes Classification– Natural, synthetic dyes and their characteristics – basic methods and principles of dyeing.</p> <hr/> <p>UNITII</p> <p>Hands on Experience (Students can choose any four)</p> <p>Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques. Preparation of Jam, squash and Jelly, Gulkand, cottage cheese.</p> <p>Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/ powder and disinfectants in small scale.</p> <p>Extraction of oils from spices and flowers.</p> <p>Testing of water samples using testing kit. Dyeing –cotton fabrics with natural and synthetic dyes Printing–tie and dye, batik.</p> | | | | | | |

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| Skills acquired From this course | Entrepreneurial skills. |
| Recommended Text | 1. George S & Muralidharan V, (2007) Fibre to Finished Fabric– A Simple Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles. |
| Reference Books | Shyam Jha, Rapid detection of food adulterant and contaminants (Theory and Practice), Elsevier, eBookISBN9087128004289, 1 st Edition, 2015 |
| Web site and e-learning source | https://www.vlab.co.in/broad-area-chemical-sciences |
| Course Learning Outcomes (for Mapping with POs and PSOs) | |
| On completion of the course the students should be able to | |
| CO1: identify adulterated food items by doing simple chemical tests. | |
| CO2: prepare cleaning products and become entrepreneurs | |
| CO3: educate others about adulteration and motivate them to become entrepreneurs. | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 9 | 9 | 9 | 9 | 9 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

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|-------------------------------------|--|-----------------|---------------------|----------------|--------------|--------------------|--|
| Title of the Course | *PESTICIDE CHEMISTRY | | | | | | |
| Paper No. | Naan mudhalvan (substitute) | | | | | | |
| Category | Skill Enhancement Course | Year | II | Credits | 2 | Course Code | |
| | | Semester | III | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 2 | - | - | | 2 | | |
| Pre requisites | Fundamentals in chemistry | | | | | | |
| Objectives of the course | <p>This course aims to providing the students</p> <ul style="list-style-type: none"> • Knowledge about the various types of pesticides and their toxicity. • To understand the accumulation of pesticides in the form of residues and its analysis. • Knowledge on choice of alternate and eco-friendly pesticides. | | | | | | |
| Course Outline | <p>Unit- I Introduction: History of pesticides. Chemistry of Pesticides: Brief introduction to classes of pesticides (Chemical class, targets), structures, chemical names, physical and chemical properties. Toxicity of pesticides: Acute and chronic toxicity in mammals, birds, aquatic species etc. Methods of analysis of pesticides.</p> <p>Unit- II Insecticides: Classification and study of following insecticides with respect to structure, chemical name, physical properties, chemical properties, synthesis, degradation, metabolism, formulations, Mode of action, uses, toxicity. Organophosphates and Phosphothionates: Acephate, Chlorpyrifos, Monocrotophos, and parathion-methyl. Organochlorine – Endosulfan, heptachlor; Carbamate: Cartaphydrochloride, Methomyl, Propoxur.</p> <p>Unit- III Pesticides residues: Introduction- application of agrochemicals, dissemination pathways of pesticides, causes of pesticide residues, remedies. Pesticides residues in atmosphere- entry into atmosphere, action of pesticides, effects on environments. Pesticides residues in water - entry into water systems, action and effect in aquatic environment. Pesticides residues in soil. entry into soil, absorption, retention and transport in soil, effects on microorganism, soil condition and fertility, decomposition and degradation by climatic factors and microorganism.</p> <p>Unit- IV Pesticide Residues effect and analysis: Effects of pesticides residue on human life, birds and animals-routes for exposure to pesticides, action of pesticides on living system. Analysis of pesticides residues- sample preparation, extraction of pesticides residues (soil, water and</p> | | | | | | |

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| | vegetables/fruits) simple methods and schemes of analysis, multi-residue analysis. |
| | Unit - V Bio pesticides: Pheromones, attractants, repellents–Introduction, types and application (8- Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure, Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate, Icaridin). Baits- Metaldehyde, Iron (II) phosphate, Indoxacarb, Zinc Phosphide, Bromadiolone. |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. Handa .S.K, Principles of pesticide chemistry. Agrobios(India);2012. 2. Matolcsy. G, Nádasy. M, Andriska. V, Pesticide chemistry. Elsevier; 1989. 3. J. Miyamoto and P. C. Kearney, Pesticide Chemistry, Human Welfare and the Environment vol. IV Pesticide Residue and Formulation Chemistry, Pergamon press, 1985. 4. R. Cremlyn: Pesticides, John Wiley. |
| Reference Books | <ol style="list-style-type: none"> 1. Roy N.K., Chemistry of Pesticides. CBS Publisher & Distributors Pvt Ltd; 1st Ed. (2010). 2. Nollet. L.M., Rathore.H.S., Handbook of pesticides: methods of pesticide residues analysis. CRC press; 2016. 3. Eller brock. R.H., Pesticide Residues: Significance, Management and Analysis, 2005 |
| Course Learning Outcomes (for Mapping with POs and PSOs) | |
| On completion of the course the students should be able to | |
| CO1: teach about the pesticides and their toxicity with respect to structure and category. | |
| CO2: explain the preparation and property of pesticides | |
| CO3: investigate the pesticide residues, prevention and care | |
| CO4: demonstrate the extraction and analytical methods of pesticide residues | |
| CO5: make awareness to the public on bio-pesticides | |

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

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|------------------------------|--|----------|--------------|---------|-------|-------------|--|
| Title of the Course | GENERAL CHEMISTRY-IV | | | | | | |
| Paper No. | Core VII | | | | | | |
| Category | Core | Year | II | Credits | 4 | Course Code | |
| | | Semester | I V | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 4 | - | - | | 4 | | |
| Pre requisites | General Chemistry III | | | | | | |
| Objectives of the course | <p>This course aims to provide a comprehensive knowledge on</p> <ul style="list-style-type: none"> • Thermodynamic concepts on chemical processes and applied aspects. • Thermochemical calculations. • Transition elements with reference to periodic properties and group study of transition metals. • the organic chemistry of ethers, aldehydes and ketones • the organic chemistry of carboxylic acids. | | | | | | |

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| Course Outline | UNIT- I Thermodynamics- I Terminology – Intensive, extensive variables, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics– Concept and significance of heat(q), work(w), internal energy(E), enthalpy(H); calculations of q, w, E and H for reversible, irreversible |
| | expansion of ideal and real gases under isothermal and adiabatic conditions; relation between heat capacities (Cp & Cv); Joule Thomson effect- inversion temperature. Thermochemistry - heats of reactions, standard states; types of heats of reactions and their applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions; Hess's law and its applications; determination of bond energy; Measurement of heat of reaction–determination of calorific value of food and fuels Zeroth law of thermodynamics – Absolute Temperature scale. |
| | Unit- II Thermodynamics -II Second Law of thermodynamics- Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing, calculation of entropy changes of an ideal gas and a van der Waals gas with changes in temperature, volume and pressure, entropy and disorder. Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation– derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. Third law of thermodynamics –Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law. |
| | UNIT -III General Characteristics of d-block elements Transition Elements- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non-transition elements– comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups |

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| | <p>UNIT- IV</p> <p>Ethers, Thioethers and Epoxides</p> <p>Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group.</p> |
| | <p>Reactions of epoxides with alcohols, ammonia derivatives and LiAlH_4, Thioethers - nomenclature, structure, preparation, properties and uses.</p> <p>Aldehydes and Ketones</p> <p>Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalyzed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Halo form reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer- Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Ponnandorf Verley reduction, reduction with LiAlH_4 and NaBH_4.</p> <p>Addition reactions of unsaturated carbonyl compounds: Michael addition.</p> |
| | <p>UNIT-V</p> <p>Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, Acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdiecker reaction. Formic acid-reducing property. Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids.</p> <p>Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schotten- Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement.</p> <p>Active methylene compounds: Keto– enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate</p> <p>Halogen substituted acids– nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids</p> <p>Hydroxy acids – nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions–action of heat on α, β and γ hydroxy acids.</p> |
| Extended | Questions related to the above topics, from various competitive |

| | |
|--|--|
| Professional Component (is a Part of internal Component only, Not to be Included in the external examination question paper) | Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. B.R.Puri and L.R.Sharma, <i>Principles of Physical Chemistry</i>, Shoban Lal Nagin Chand and Co., thirty three edition, 1992. K.L.Kapoor, A Textbook of Physical chemistry, (volume-2 and 3), Macmillan, India Ltd, third edition, 2009. 2. P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i>, Sultan Chand & Sons, twentieth edition, 2006. 3. M.K. Jain, S.C. Sharma, <i>Modern Organic Chemistry</i>, Vishal Publishing, fourth reprint, 2003. 4. S.M. Mukherji, and S.P. Singh, <i>Reaction Mechanism in Organic Chemistry</i>, Macmillan India Ltd., third edition, 1994. |
| Reference Books | <ol style="list-style-type: none"> 1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i>, 4thed.; The Macmillan Company: New York, 1972. 2. Lee, J.D. <i>Concise Inorganic Chemistry</i>, 4thed.; ELBS William Heinemann: London, 1991. 3. Gurudeep Raj, <i>Advanced Inorganic Chemistry</i>, 26thed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P. W. & Paula, J. <i>Physical Chemistry</i>, 10thed.; Oxford University Press: New York, 2014. 5. Huheey, J. E. <i>Inorganic Chemistry: Principles of Structure and Reactivity</i>, 4th ed; Addison Wesley Publishing Company: India, 1993. |
| Website and e-learning source | MOOC components https://nptel.ac.in/courses/112102255 Thermodynaamics https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

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

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

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

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

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

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | |
|---------------------|--|----------|-----|---------|---|-------------|
| Title of the Course | QUALITATIVE INORGANIC ANALYSIS OF MIXTURE OF SALTS | | | | | |
| Paper No. | Core- VIII | | | | | |
| Category | Core | Year | II | Credits | 2 | Course Code |
| | | Semester | III | | | |

| Instructional hours per week | Lecture | Tutorial | Lab Practice | Total |
|---|---|----------|--------------|-------|
| | | | 2 | 2 |
| Pre requisites | General Chemistry | | | |
| Objectives of the course | To develop the skill on systematic analysis of mixture of inorganic salts containing two cations and two anions. To study the principle of the experiments. | | | |
| Course Outline | Semi-Micro Qualitative Analysis <ol style="list-style-type: none"> 1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, chloride, bromide, iodide, nitrate. 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate. 3. Elimination of interfering acid radicals and Identifying the group of basic radicals 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, iron, aluminium, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium. 5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type) | | | |
| Skills acquired from this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. | | | |
| Recommended Text | Reference Books: V.Venkateswaran, R.Veera swamy and A.R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997. | | | |
| Website and e-learning source | https://www.vlab.co.in/broad-area-chemical-sciences | | | |
| Course Learning Outcomes (for Mapping with POs and PSOs) | | | | |

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

CO1: acquire knowledge on the systematic analysis of Mixture of salts.

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

CO3: identify the cations and anions in the soil and water and to test the quality of water.

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

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

CO-PO Mapping (Course Articulation Matrix)

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|-------------------------------------|--|-------------------|-----------------------|----------------|---|--------------------|--|
| Title of the Course | INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS | | | | | | |
| Paper No. | SEC V (Discipline specific) | | | | | | |
| Category | Skill Enhancement Course | Year II | Semester IV | Credits | 2 | Course Code | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | Total | | | |
| | 2 | - | - | 2 | | | |
| Pre requisites | General Chemistry | | | | | | |
| Objectives of the course | The course aims at providing an overall lview of the <ul style="list-style-type: none"> • Operation and troubleshooting of chemical instruments • Fundamentals of analytical techniques and its application in the characterization of compounds • Theory of chromatographic separation and | | | | | | |
| | <ul style="list-style-type: none"> • Theory of thermo/electro analytical techniques • Stoichiometry and the related concentration terms | | | | | | |

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| Course Outline | <p>UNIT-I Qualitative and Quantitative Aspects of Analysis S.I Units, Distinction between Mass and Weight. Moles, Millimoles, Milliequivalence, Molality, Molarity, Normality, Percentage by Weight and Volume, ppm, ppb. Density and Specific Gravity of Liquids. Stoichiometry Calculations Sampling, evaluation of analytical data, Errors – Types of Errors, Accuracy, Precision, Minimization of Errors. Significant Figures. Methods of Expressing Precision: Mean, Median, Average Deviation, Standard Deviation, Coefficient of Variation, Confidence Limits, Q- test, F-test, T-test. The Least Square Method for Deriving Calibration plots.</p> |
| | <p>UNIT-II Atomic Absorption Spectroscopy: Basic principles of instrumentation-choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.</p> |
| | <p>UNIT-III UV-Visible and IR Spectroscopy Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law. UV-Visible Spectrometry: Basic principles, instrumentation – choice of source, monochromator and detector for single and double beam instrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. Infrared Spectroscopy: Basic principles of instrumentation - choice of source, monochromator & detector for single and double beam instrument; sampling techniques.</p> |
| | <p>UNIT - IV Thermal and Electro-analytical Methods of Analysis TGA and DTA- Principle, Instrumentation, methods of obtaining Thermograms, factors affecting TGA/DTA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate DSC-Principle, Instrumentation and applications. Electro analytical methods: polarography - principle, instrumentation and applications. Derivative polarography- Cyclic Voltammetry - principle.</p> |

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| | <p>UNIT-V Separation and purification techniques Classification, principle, Factors affecting –Solvent Extraction–Liquid–Liquid Extraction, Chromatography: Column, TLC, Paper, Gas, HPLC and Electrophoresis, Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and Rf value.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |
| <p>Recommended Text</p> | <ol style="list-style-type: none"> 1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman. 2. R. Gopalan, P.S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007 3. Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint (2017). 4. R. Speyer, Thermal Analysis of Materials, CRC Press, 1993. 5. R.A. Day and A.L. Underwood, Quantitative Analysis, 6th edn., Prentice Hall of India Private Ltd., New Delhi, 1993 |
| <p>Reference Books</p> | <ol style="list-style-type: none"> 1. D. A. Skoog, D. M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5th edn., Saunders college publishing, Philadelphia, 1998. 2. Dash U.N, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011. 3. Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York, 2004. 4. Mikes, O. & Chalmers, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elsevier Harwood Ltd. London 5. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Text book of Quantitative Chemical Analysis, sixth edition Pearson Education, 2000 |
| <p>Website and e-learning sources</p> | <ol style="list-style-type: none"> 1. http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf 2. http://eric.ed.gov/?id=EJ386287 3. http://www.sjsu.edu/faculty/watkins/diamag.htm 4. http://www.britannica.com/EBchecked/topic/108875/separation- |

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| | and-purification 5. http://www.chemistry.co.nz/stoichiometry.htm |
| Course Learning Outcomes (for Mapping with PO's and PSO's) | |
| On completion of the course the students should be able to | |
| CO1: apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and Atomic Absorption spectrometry | |
| CO2: explain theory, instrumentation and application of UV visible and Infrared spectroscopy. | |
| CO3: able to discuss instrumentation, theory and applications of thermal and electrochemical techniques | |
| CO4: explain the use of chromatographic techniques in the separation and identification of mixtures | |
| CO5: explain preparation of solutions, stoichiometric calculations. | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| | | | | | | | |
|-------------------------------------|--|----------------------|---------------------|----------------|--------------|--------------------|--|
| Title of the Course | *FORENSIC SCIENCE | | | | | | |
| Paper No. | Naan mudhalvan (substitute) | | | | | | |
| Category | Skill Enhancement Course | Year Semester | II IV | Credits | 2 | Course Code | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 2 | - | - | | 2 | | |
| Pre requisites | General Chemistry | | | | | | |
| Objectives of the course | <p>This course aims at giving an overall view of</p> <ul style="list-style-type: none"> • Crime detection through analytical instruments • Forgery and its detection • medical aspects involved | | | | | | |
| Course Outline | <p>UNIT-I</p> <p>Poisons Poisons - types and classification - diagnosis of poisons in the living and the dead -clinical symptoms - postmortem appearances. Heavy metal contamination (Hg, Pb, Cd)of sea foods-use of neutron activation analysis in detecting arsenic in human hair. Treatment in cases of poisoning–use of antidotes for common poisons.</p> <p>Unit-II</p> <p>Crime Detection Accidental explosion during manufacture of matches and fireworks (as in Sivakasi).Human bombs-possible explosives (gelatin sticks and RDX) - metal detector devices and other security measures for VVIP-composition of bullets and detecting powder burns.</p> <p>UNIT-III</p> <p>Forgery and Counter feiting Documents - different types of forged signatures - simulated and traced forgeries –inherent signs of forgery methods-writing deliberately modified - uses of ultraviolet rays -comparison of type written letters – checking silver line water mark in currency notes – alloy analysis using AAS to detectcounterfeitcoins–detectionofgoldpurityin22caratornaments– detecting gold plated jewels-authenticity of diamond.</p> <p>UNIT-IV</p> <p>Tracks and Traces Tracks and traces – small tracks and police dogs –of footprints – costing</p> | | | | | | |

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| | <p>of footprints – residue prints, walking pattern or tyre marks–miscellaneous trace sand tracks–glass fracture-tool marks-paints-fibres-Analysis of biological substances - blood, semen, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - detecting steroid consumption in athletes and racehorses.</p> |
| | <p>UNIT-V</p> <p>Medical Aspects</p> <p>Aids – causes and prevention-misuse of scheduled drugs-burns and their treatment by plastic surgery. Metabolite analysis using mass spectrum - Gas chromatography-Arson -natural fires and arson - burning characteristics andchemistryofcombustiblematerials-natureofcombustion.Ballistics-classification - internal and terminal ballistics - small arms -laboratory examination of barrel washing and detection of powder residue by chemical tests.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Website and e-learning source</p> | <ol style="list-style-type: none"> 1. http://www.library.ucsb.edu/ist/03-spring/internet.html 2. http://www.wonderhowto.com/topic/forensic-science/ |

Course Learning Outcomes (for Mapping with POs and PSOs)**On completion of the course the students should be able to****CO1:** learn about the Poisons-types and classification of poisons in the living and the dead organisms and also get information about Postmortem.**CO2:** get awareness on Human bombs, possible explosives (gelatin sticks and RDX)and metal detector devices and other security measures for VVIP – composition of bullets and detecting powder burns**CO3:** detect the forgery documents, different types of forged signatures**CO4:** have an idea about how to tracks and trace using police dogs, foot prints identification and gain the knowledge in analyzing biological substances - blood, semen, saliva, urine and hair-DNA Finger printing for tissue identification in dismembered bodies**CO5:** get the awareness on Aids-causes and prevention and also have an exposure on handling fire explodes.

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

CO-PO Mapping (Course Articulation Matrix)

| CO/PO | 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 PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| | | | | | | | |
|-------------------------------------|---|-----------------|---------------------|----------------|--------------|--------------------|--|
| Title of the Course | ORGANIC CHEMISTRY-I | | | | | | |
| Paper No. | Core- IX | | | | | | |
| Category | Core | Year | III | Credits | 4 | Course Code | |
| | | Semester | V | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 4 | 1 | - | | 5 | | |
| Pre requisites | General Chemistry I, II, III and IV. | | | | | | |
| Objectives of the course | <p>This course aims to provide an understanding of</p> <ul style="list-style-type: none"> • Stereoisomerism in chirals and geometric isomerism in olefins, conformations of ethane and butane • preparation and properties of aromatic and aliphatic nitro compounds and amines • preparation of different dyes, food colour and additives • preparation and properties of five membered heterocycles like pyrrole, furan and thiophene • preparation and properties of six membered heterocycles like pyridine, quinolone and isoquinoline. | | | | | | |
| Course Outline | <p>UNIT- I Stereochemistry</p> <p>Fischer Projection, Newmann and Sawhorse Projection formulae and their inter conversions; Geometrical isomerism: cis–trans, syn-anti isomerism, E/Z notations.</p> <p>Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures –molecules with one and two chiral centres, racemization –methods of racemisation; resolution- methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres.</p> <p>Molecules with no asymmetric carbon atoms – allenes and biphenyls. Conformational analysis of ethane and butane.</p> | | | | | | |

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| | <p>UNIT-II Chemistry of Nitrogen Compounds-I</p> <p>Nitro alkanes Nomenclature, isomerism, preparation from alkyl halides, halo acids, alkanes; physical properties; reactions – reduction, halogenations, Grignard reagent, Pseudo acid character. Nitro-acinitro tautomerism.</p> <p>Aromatic nitro compounds Nomenclature, preparation –nitration, from diazonium salts, physical properties; reactions –reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT.</p> |
| | <p>Amines: Aliphatic amines Nomenclature, isomerism, preparation – Hofmanns’ degradation reaction, Gabriel’s phthalimide synthesis, Curtius Schmidt rearrangement.</p> <p>Physical properties, reactions – alkylation, acylation, carbylamine reaction, Mannich reaction, oxidation, basicity of amines.</p> |
| | <p>UNIT- III Chemistry of Nitrogen Compounds –II</p> <p>Aromatic amines – Nomenclature, preparation – from nitro compounds, Hofmann’s method; Schmidt reaction, properties - basic nature, ortho effect; reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation.</p> <p>Distinction between primary, secondary and tertiary amines - aliphatic and aromatic Diazonium compounds.</p> <p>Diazomethane, Benzene diazonium chloride -preparations and synthetic applications.</p> <p>Dyes Theory of colour and constitution; classification based on structure and application; preparation–Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green. Industry oriented content</p> <p>Dyes Industry, Foodcolour and additives.</p> |

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| | <p>UNIT- IV Heterocyclic compounds Nomenclature and classification. General characteristics - aromatic character and reactivity. Five-membered heterocyclic compounds</p> <p>Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.</p> <p>Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.</p> <p>Thiophene synthesis – from acetylene; reactions–reduction; oxidation;</p> |
| | <p>Electrophilic substitution reactions.</p> <p>UNIT -V Six-membered heterocyclic compounds</p> <p>Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution – uses, Condensed ring systems.</p> <p>Quinoline – preparation – Skraup synthesis and Friedlander’s synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction</p> <p>Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| Skills acquired From this course | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |

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| Recommended Text | <p>1.M.K. Jain, S.C. Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2009.</p> <p>2. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009.</p> <p>3. Arun Bahl and B.S. Bahl, Advanced organic chemistry, NewDelhi, S. Chand & Company Pvt. Ltd., Multicolour edition, 2012.</p> <p>4. P. L. Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.</p> <p>5.C.N.Pillai,Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.</p> |
| Reference Books | <p>1. R. T. Morrison and R.N. Boyd, Organic Chemistry, Pearson Education, Asia, sixth edition, 2012.</p> <p>2. T.W. Graham Solomons, Organic Chemistry, John Wiley & Sons, Eleventh edition, 2012.</p> |
| | <p>3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition, 2009.</p> <p>4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006.</p> <p>5. J.A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.</p> |
| Web site and e-learning sources | <p>1. www.epgpathshala.nic.in</p> <p>2. www.nptel.ac.in</p> <p>3. http://swayam.gov.in</p> <p>4. Virtual Text book of Organic Chemistry</p> |
| <p>Course Learning Outcomes (for Mapping with PO's and PSO's)</p> <p>On completion of the course the students should be able to</p> <p>CO1: assign R S notations to chirals and E Z notations to olefins and explain conformations of ethane and butane.</p> <p>CO2: explain preparation and properties of aromatic and aliphatic nitro compounds and amines.</p> <p>CO3: explain colour and constitution of dyes and food additives.</p> <p>CO4: discuss preparation and properties of five membered hetero cycles like pyrrole, furan and thiophene</p> <p>CO5: discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.</p> | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's.

| | | | | | | | |
|-------------------------------------|---|-----------------|---------------------|----------------|---|--------------------|--|
| Title of the Course | INORGANIC CHEMISTRY-I | | | | | | |
| Page rNo. | Core X | | | | | | |
| Category | Core | Year | III | Credits | 4 | Course Code | |
| | | Semester | V | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | | Total | |
| | 4 | 1 | - | | | 5 | |
| Pre requisites | General Chemistry I, II, III and IV. | | | | | | |
| Objectives of the course | <p>The course aims to provide knowledge on</p> <ul style="list-style-type: none"> • nomenclature, isomerism and theory of coordination compounds, and chelate complexes • crystal field theory, magnetic properties, stability of complexes and Jahn Teller effect • preparation and properties of metal carbonyls • Lanthanoids and actinoids • Preparation and properties of inorganic polymers | | | | | | |
| Course Outline | <p>UNIT - I Co-ordination Chemistry - I</p> <p>IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds. Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory–geometry of co-ordination compounds with co-ordination number 4&6.</p> <p>Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis – application of DMG and oxine in gravimetric analysis – estimation of hardness of water using EDTA, metal ion indicators.</p> <p>Role of metal chelates in living systems – haemoglobin and chlorophyll</p> | | | | | | |
| | <p>Unit - II Co-ordination Chemistry - II</p> <p>Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series – calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ - Jahn – Teller effect. Stability of complexes in aqueous solution, stability constants - factors affecting the stability of a complex ion, thermodynamic and kinetic Stability (elementary idea). Comparison of VBT and CFT.</p> | | | | | | |

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| | <p>UNIT -III Organo metallic compounds</p> <p>Metal Carbonyls Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls.</p> <p>Ferrocene – Methods of preparation, physical and chemical properties.</p> |
| | <p>UNIT - IV Inner transition elements (Lanthanoids and Actinoids)</p> <p>General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra –Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction-Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.</p> |
| | <p>UNIT - V Inorganic polymers</p> <p>General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) – preparation and properties of silicones (poly dimethyl siloxane and poly methyl hydro siloxane) phosphorous based polymer (poly phosphazines and poly phospho nitrilic chloride), sulphur based polymer (poly sulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferables skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. Puri . B. R, Sharma. L. R, Kalia. K. C. (2011), Principles of Inorganic Chemistry, 31th Edition, Milestone Publishers & Distributors, Delhi. 2. Satya Prakash, Tuli. G.D., Basu.S.K., Madan. R. D. (2009), |

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| | <p>Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi</p> <p>3. Lee. J. D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBS William Heinemann, London.</p> <p>4. W. V. Malik, G. D. Tuli, R. D. Madan, (2000), Selected Topics in Inorganic Chemistry, S.Chand and Company Ltd.</p> <p>5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992.</p> |
| Reference Books | <p>1. Madan R. D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S.Chand and Company, New Delhi.</p> <p>2. Gopalan. R, (2009) Inorganic Chemistry for Undergraduates, 1st Edition, University Press (India) Private Limited, Hyderabad</p> <p>3. Sivasankar. B, (2013) Inorganic Chemistry. 1st Edition, Pearson, Chennai.</p> <p>4. Alan . G. Sharp. 1992), Inorganic Chemistry, 3rd Edition, Addison - Wesley, England.</p> <p>5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.</p> |
| Web site and e-learning source | <p>1. www.epgpathshala.nic.in</p> <p>2. www.nptel.ac.in</p> <p>3. http://swayam.gov.in</p> |
| <p>Course Learning Outcomes (for Mapping with PO's and PSO's)</p> <p>On completion of the course the students should be able to</p> <p>CO1: explain isomerism, Werner's Theory and stability of chelate complexes.</p> <p>CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.</p> <p>CO3: explain preparation and properties of metal carbonyls.</p> <p>CO4: give a comparative account of the characteristics of lanthanoids and actinoids.</p> <p>CO5: explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous.</p> | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

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|-------------------------------------|--|-----------------|---------------------|----------------|--------------|--------------------|--|
| Title of the Course | PHYSICAL CHEMISTRY-I | | | | | | |
| Paper No. | Core - XI | | | | | | |
| Category | Core | Year | III | Credits | 4 | Course Code | |
| | | Semester | V | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | | |
| | 4 | 1 | - | | 5 | | |
| Pre requisites | General Chemistry I, II, III and IV. | | | | | | |
| Objectives of the course | <p>The course aims at providing an overall view of</p> <ul style="list-style-type: none"> • Gibbs free energy, Helmholtz free energy, Ellingham's diagram and partial molar properties. • Chemical kinetics and different types of chemical reactions. • Adsorption, homogeneous and heterogeneous catalysis. • Colloids and macromolecules. • Photochemistry, fluorescence and phosphorescence. | | | | | | |
| Course Outline | <p>UNIT- I Thermodynamics - III</p> <p>Free energy and work functions – Need for free energy functions, Gibbs free energy, Helmholtz free energy – their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.</p> <p>Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs-Duhem – Margules equation.</p> | | | | | | |

UNIT- II

Chemical Kinetics

Rate of reaction – Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. Order and molecularity of simple and complex reactions, Rate laws-Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) – Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry.

Effect of temperature on reaction rate – temperature coefficient – concept of activation energy –Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT.

Complex reactions – reversible and parallel reactions (no derivation and only examples)

–kinetics of consecutive reactions – steady state approximation.

UNIT -III

Adsorption – Chemical and physical adsorption and their general characteristics – distinction between them. Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalyzed reaction – Michaelis-Menten and Briggs - Haldene equation – Line weaver- Burk plot – inhibition – reversible – competitive, noncompetitive and uncompetitive (no derivation of rate equations)

Catalysis – general characteristics of catalytic reactions, autocatalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid-base and enzyme catalysis. Heterogenous catalysis.

UNIT IV

Colloids and Surface Chemistry

Colloids: Types of Colloids, Characteristics of Colloids (Lyophilic and Lyophobic sols), Preparation of Sols - Dispersion methods, aggregation methods, Properties of Sols - Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis,

Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels-preparation of Gels, Applications of colloids,

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| | <p>Macromolecules: Molecular weight of Macromolecules - Number average molecular weight – average molecular weight, Determination of Molecular weight of molecules</p> |
| | <p>UNIT- V Photo chemistry</p> <p>Laws of photo chemistry – Lambert – Beer, Grothaus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – rate law – Kinetics of H₂-Cl₂, H₂-Br₂ and H₂-I₂ reactions, comparison between thermal and photo chemical reactions.</p> <p>Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications – chemiluminescence and photosensitisation – examples Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |
| <p>Recommended Text</p> | <ol style="list-style-type: none"> 1. B. R. Puri and L. R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. Arun Bahl, B. S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition , 2019, S. Chand &CO. 4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J. Rajaram and J.C. Kuriacose, Thermodynamics, Shoban Lal. Nagin Chand and CO., 1986. |
| <p>Reference Books</p> | <ol style="list-style-type: none"> 1. J. Rajaram and J. C. Kuriacose, Chemical Thermodynamics, Pearson, 1st edition, 2013. 2. Keith. J. Laidler, Chemical kinetics, third edition , Pearson, 2003. 3. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. 4. K. L. Kapoor, A Text book of Physical Chemistry, Macmillan |

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| | India Ltd, third edition, 2009. 5. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition,2001 |
| Web site and e-learning source | 1. https://nptel.ac.in 2. https://swayam.gov.in 3. www.epgpathshala.nic.in |
| Course Learning Outcomes (for Mapping with PO's and PSO's) | |
| On completion of the course the students should be able to | |
| CO1: explain Gibbs and Helmholtz free energy functions, partial molar quantities and Elling hams . | |
| CO2: apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation. | |
| CO3: compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis. | |
| CO4: demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules. | |
| CO5: utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision. | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's.

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|---|---|-----------------|---------------------|----------------|--------------|--------------------|
| Title of the Course | BIO CHEMISTRY | | | | | |
| Paper No. | EC -V A | | | | | |
| Category | Elective | Year | III | Credits | 3 | Course Code |
| | | Semester | V | | | |
| Instructional hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | 1 | - | | 4 | |
| Pre requisites | Organic Chemistry-I | | | | | |
| Objectives of the Course | <p>The course aims at providing knowledge on</p> <ul style="list-style-type: none"> • Relationship between biochemistry and medicine, composition of blood. • Structure and properties of amino acids, peptides, enzyme, vitamins and proteins. • Biological functions of proteins, enzymes, vitamins and hormones. • Biochemistry of nucleic acids and lipids. • Metabolism of lipids | | | | | |
| Course Outline | UNIT I | | | | | |
| | <p>Logic of Living Organisms Relationship of Biochemistry and Medicine Blood -Composition of Blood, Blood Coagulation –Mechanism. Hemophilia and Sickle Cell Anaemia Maintenance of Ph of Blood –Bicarbonate Buffer, Acidosis, Alkalosis.</p> | | | | | |
| | UNIT II | | | | | |
| | <p>Peptides and Proteins Amino acids – nomenclature, classification – essential and Non-essential; Synthesis – Gabriel Phthalimide, Strecker; properties–zwitter Ion and iso electric point, electrophoresis and reactions.</p> <p>Peptides – peptide bond – nomenclature – synthesis of simple peptides– Solution and solid phase. Determination of structure of peptides, N-Terminal analysis –Sanger’s & Edmann method; C terminal analysis-Enzymic method.</p> <p>Proteins – classification based on composition, functions and structure; Properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure Of proteins–primary, secondary, tertiary and quaternary. Metabolism of Amino acids–general aspects of metabolism (a brief outline) ;urea cycle.</p> | | | | | |
| UNIT - III | | | | | | |
| <p>Enzymes and Vitamins Nomenclature and classification, characteristics ,factors influencing Enzyme activity–mechanism of enzyme action–Lock and key</p> | | | | | | |

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| | <p>hypothesis, Koshland's induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes;allosteric enzyme regulation. Vitamins as coenzymes–functions of TPP ,lipoic acid, NAD,NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.</p> |
| | <p>UNIT -IV Amino acids Components of nucleic acids – nitrogenous bases and pentose sugars, Structure of nucleosides and nucleotides, DNA – structure &functions;</p> |
| | <p>RNA–types–structure-functions;biosynthesis of proteins Hormones Adrenalin and thyroxine—chemistry,structure and function s(No structure elucidation).</p> |
| | <p>UNIT-V Lipids Occurrence, biological significance of fats, classification of lipids. Simple lipids– Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats–saponification number, iodine number, acid value, R.M.value. Distinction between animal and vegetable fats. Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons– biological significance. Cholesterol– occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| Skills acquired From this course | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |

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| Recommended Text | <ol style="list-style-type: none"> 1. Bahl. B. S.; Bhal. A, <i>Advanced Organic Chemistry</i>, 3rded.; S. Chand: New Delhi, 2003. 2. Jain. M.K.; Sharma,S.C, <i>Modern Organic Chemistry</i>, Vishal Publications:NewDelhi,2017. 3. Shanmugam.A, <i>Fundamentals of Biochemistry for Medical Students</i>, 6th ed.; Published by the author, 1999. 4. Veerakumari. L, <i>Biochemistry</i>,1sted.;MJP Publications: Chennai, 2004. 5. Jain. J.L.;<i>Fundamentals of Biochemistry</i>, 2nded.; S.Chand:NewDelhi,1983. |
| Reference Books | <ol style="list-style-type: none"> 1. Conn. E.E.; Stumpf. P.K, <i>Outline of Biochemistry</i>,5thed.;Wiley Eastern: NewDelhi, 2002. 2. West. E.S.;Todd,W.R.;Mason,H.S.;VanBruggen. J.T, <i>Text Book of Biochemistry</i>, 4thed.; Macmillan: New York, 1970. 3. Lehninger. A.L, <i>Principles ofBiochemistry</i>,2nded.;CBS Publisher: Delhi, 1993. 4. Rastogi,. S.C,<i>Biochemistry</i>,2nded.;TataMcGraw-Hill:NewDelhi, |
| | <p>2003.</p> <p>5.Chatterjea. M.N.;Shinde. R., <i>Textbook of Medical Biochemistry</i>,5thed.;Jaypee Brothers:NewDelhi,2002.</p> |
| Website and e-learning source | <p>1)http://library.med.utah.edu/NetBiochem/nucacids.html2)http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKinetics.html</p> <p>3) https://swayam.gov.in/courses/4384-biochemistryBiochemistry</p> <p>4) https://onlinecourses.nptel.ac.in/noc19_cy07/previewExperimentalBiochemistry</p> |
| <p>Course Learning Outcomes (for Mapping with PO's and PSO's) On completion of the course the students should be able to</p> <p>CO1: explain molecular logic of living organisms, composition of blood and blood coagulation. CO2: explain synthesis and properties of amino acids, determination of structure of peptides and proteins. CO3: explain factors influencing enzyme activity and vitamins as coenzymes. CO4: explain RNA and DN A structure and functions. CO5: explain biological significance of simple and compound lipids.</p> | |

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

| | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|---|
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

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|------------------------------|--|----------|--------------|---------|---|-------------|--|
| Title of the Course | NANO SCIENCE | | | | | | |
| Paper No. | EC -VB | | | | | | |
| Category | Elective | Year | III | Credits | 3 | Course Code | |
| | | Semester | VI | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | | Total | |
| | 4 | | - | | | 4 | |
| Prerequisites | Basics knowledge in physics and chemistry | | | | | | |
| Objectives of the course | <p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • Introduction to nanoparticles/clusters and nanocomposites • Properties of nanomaterials • Characterization of nanomaterials by different methods • Synthesis of carbon nanotubes, graphene, quantum dots, self-assembled nanomaterials • Applications of nanomaterials as sensors | | | | | | |
| Course Outline | <p>UNIT- I Introduction to nanoscience Definition of terms- nanoscience, nanoparticles, clusters, quantumdots, nanostructures and nanocomposites. Electron behaviour infreespace, bulk material and nanomaterials. Synthesis and stabilization of nanomaterials Top down approach (physical methods),mechanical dispersion-ball milling, methods based on evaporation of a precursor-inert gas condensation, ion sputtering, spray pyrolysis, aerosol synthesis-nanolithography. Bottom-up approach (chemical methods) - solvothermal synthesis, photochemical method, gamma radiolysis, sonochemical synthesis, electro deposition, sol-gel method, nanomaterials via chemical routes- solvents reducing agents, cappingagents-stabilizationofnanoparticles-electrostaticandsteric stabilization, common stabilizers, nanoparticle grow thin solution,</p> | | | | | | |

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| | <p>Template growth, Langmuir–Blodgett(L-B)method, reverse micelles-Emulsion method.</p> |
| | <p>Unit - II Properties of materials on a nano scale Optical properties of metal and semiconductor nanomaterials-surface Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), Quantum confinement effect, tuning of optical spectrum. Magnetic properties-Fe_3O_4 particle, supermagnetic properties, electronic properties, Chemical properties-chemical process on the surface of nanoparticles, catalysis, mechanical properties.</p> |
| | <p>UNIT - III Techniques employed for characterisation of nanomaterials Spectroscopy–UV- visible, Photoelectron spectroscopy–Electron microscopy–Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning probe microscopy (SPM)– Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Optical microscopy–confocal microscopy, X-ray diffraction (XRD) [Principle and Block diagram only].</p> |
| | <p>UNIT - IV Special nanomaterials Carbon Nano Structures Carbon nanotubes: Introduction-types-zigzag, Armchair, helical, synthesis by CVD, Functionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes, Field emission, Fuel Cells, Display devices. Other Important Carbon based materials: Preparation and Characterization Fullerene, Graphene, properties, DLC and Nanodiamonds and Applications Semiconductor nanoparticles: Quantum dots, synthesis–chemical Synthesis using clusters, properties, porous silicon–electrochemical etching, aerogel–types–silica aerogel, resorcinol formaldehyde (RF) aerogels, zeolites–applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMs)– inorganic, organic molecules.</p> |
| | <p>UNIT- V Application of nanomaterials Biomedical Applications-drug, drug delivery, biolabelling, artificial implants, cancer treatment. Sensors– Natural nanoscale sensors, Chemical sensors, biosensors, electronic noses. Optics & Electronics–Nanomaterials in the next generation computer technology, high definition TV, flat panel displays, quantum dot laser, Single electron transistors [SET]. Nanotechnology in agriculture–Fertilizer and pesticides nanomaterials For water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology–human & environmental safety risks.</p> |
| Extended Professional Component (is a | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |

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| part of internal 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 | <ol style="list-style-type: none"> 1. Sulabha K. Kulkarni, <i>Nanotechnology: Principles and Practices</i>, Capital Publishing Co., New Delhi. 2. Pradeep. T, <i>Nano: The Essentials, Understanding Nanoscience and Nanotechnology</i>; Tata McGraw-Hill Publishing Company Limited, NewDelhi, 2007. 3. Shah. M.A.; Tokeer Ahmad, <i>Principles of Nanoscience and Nano technology</i>; Narosa PublishingHouse, NewDelhi, 2010. 4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. James Murday, <i>Textbook of Nanoscience and Nanotechnology</i>; Universities press, India Ltd ,Hyderabad. 2012. |
| Reference Books | <ol style="list-style-type: none"> 1. Sharma. P.K., <i>Understanding Nanotechnology</i>; Vista International Publishing House, Delhi. 2008. 2. Charles P. Poole Jr.; Frank J. Owens. <i>Introduction to Nanotechnology</i>; AJohnWiley&Sons, INC., Publication, 2003. 3. ViswanathanB., <i>NanoMaterials</i>; Narosa Publishing House, New Delhi, 2009. 4. Edited by C.N.R. Rao; Mu¨ller.A; Cheetham, A.K. <i>Nanomaterials Chemistry Recent Developments and New Directions</i>, WILEY-VCH Verlag GMBH & Co., KGaA, Darmstad. 5. Jing Zhong Zhang, <i>Optical properties and spectroscopy of Nanomaterials</i>; World Scientific Publishing Pvt. Ltd., Singapore. |
| Website and e-learning source | <ol style="list-style-type: none"> 1) http://www.nanotechnology.com/docs/wtd015798.pdf 2) http://nccr.iitm.ac.in/Nanomaterials.pdf |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</p> <p>CO1: explain the general concepts and physical phenomena of relevance within the field of nanoscience.</p> <p>CO2: describe the properties, synthesis, characteristics of nanomaterials, special nanomaterials and applications.</p> <p>CO3: examine the structure, properties, applicability and characterization of nanomaterials.</p> <p>CO4: analyze various synthesis procedures, characterizations and uses of carbon nanotubes, fullerene and grapheme.</p> <p>CO5: discuss applications of nanomaterials of sensors and in optics and electronics.</p> | |

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

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|------------|---|---|---|---|---|---|---|---|---|---|
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

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

Level of Correlation between PSO's and CO's

| | | | | | | |
|-------------------------------------|--|-----------------|---------------------|----------------|--------------|--------------------|
| Title of the Course | INDUSTRIAL CHEMISTRY | | | | | |
| Paper No. | EC-VI A | | | | | |
| Category | Elective | Year | III | Credits | 3 | Course Code |
| | | Semester | V | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | - | - | | 4 | |
| Pre requisites | General Chemistry I, II, III and IV. | | | | | |
| Objectives of the course | <p>This course is designed to provide knowledge on</p> <ul style="list-style-type: none"> • Classifications and characteristics of fuels • Preparation of cosmetics. • Manufacture of sugar, paper, cement. leather and food processing. • Applications of abrasives, lubricants and other industrial products. • Intellectual property rights. | | | | | |
| Course Outline | <p>UNIT-I Survey of Indian Industries and mineral resources in India</p> <p>Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal-proximate analysis and ultimate analysis; calorific value - determination, carbonization of coal.</p> <p>Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol- knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number.</p> <p>Gaseous fuel: advantages over solid and liquid fuels; water gas, producer gas, carbureted watergas - preparations-uses.</p> <p>Natural gas: LPG-composition, advantages, application; gobar gas-production, composition, advantages, application. Propellants – rocket fuels (basic idea)</p> <p>UNIT-II Cosmetics</p> <p>Skin care: powders, ingredients; creams and lotion-cleansing, moisturising, all purpose shaving cream, sunscreen; make up preparations.</p> <p>Dental care: toothpastes–ingredients.</p> <p>Hair care: shampoos -types, ingredients; conditioners -types, ingredients. Perfumes: natural – plant origin – parts of the plant used, chief constituents;</p> | | | | | |

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| | <p>animal origin - amber gries, civetone and musk; synthetic classification- esters – amyl salicylate alcohols - citronellol; terpeneols - geraniol and nerol; ketones - muskone, coumarin; aldehydes - vanilin.</p> <p>Soaps and Detergents</p> <p>Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.</p> <p>Detergents - definition, properties – cleansing action; soapless detergents - anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.</p> |
| | <p>UNIT-III</p> <p>Sugar Industry</p> <p>Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar.</p> <p>Food Preservation and processing</p> <p>Food spoilage – causes; Food preservation – methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.</p> |
| | <p>UNIT-IV</p> <p>Abrasives</p> <p>Definition, characteristics, types - natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.</p> <p>Leather Industry</p> <p>Structure and composition of skin, hide; Manufacture of leather–pre- tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome–one bath, two bath process; finishing.</p> <p>Paper Industry</p> <p>Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.</p> |
| | <p>UNIT-V</p> <p>Lubricants</p> <p>Definition, classification-liquid, semi-solid, solid and synthetic; properties – viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases - properties, types; cutting fluids,</p> |

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| | <p>Selection of lubricants.</p> <p>Cement Industry</p> <p>Cement – types, raw materials; manufacture - wetprocess, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.</p> <p>Intellectual Property Rights</p> <p>Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, Nonobviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |
| <p>Recommended Text</p> | <ol style="list-style-type: none"> 1. Sharma, B. K. <i>Industrial Chemistry</i>, 9thed.; Goel Publishing House: Meerut, 1998. 2. Wilkinson. J. B. E, Moore.R. J, <i>Harry's Cosmeticology</i>, 7thed.; Chemical Publishers: NewYork, 1982. 3. Alex. V. Ramani, <i>Food Chemistry</i>, MJ P publishers: Chennai,2009. 4. Jaya shree Ghosh, <i>Applied Chemsitry</i>, S. Chand: NewDelhi, 2006. 5. Srilakshmi, B. <i>Food Science</i>, 4thed.; New Age International Publication, 2005. |
| <p>Reference Books</p> | <ol style="list-style-type: none"> 1. Jain. P.C.; Jain. M, <i>Engineering Chemistry</i>, 16thed.;Dhanapet Rai: Delhi, 1992. 2. George Howard, <i>Principles and Practice of Perfumes and Cosmetics</i>, Stanley Therones, Cheltenham: UK, 1987. 3. Thankamma Jacob, <i>Foods, Drugs and Cosmetics - AConsumer Guide</i>, Macmillan : London, 1997. 4. Shankuntala Manay. N.; Shadakshara swamy. M, <i>Food Facts and Principles</i>, 3rded.; New Age Publication, 2008. 5. Neeraj Pandey, Khushdeep Dharni, <i>Intellectual Property Rights</i>, PHI Learning, 2014. |

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| Web site and e-learning source | 1. http://www.sciencecases.org/irradiation/irradiation_notes.asp 2. http://discovery.kcpc.usyd.edu.au//9.5.5/ 3. https://www.wipo.int/about-ip/en/ 4. www.nptel.ac.in 5. http://swayam.gov.in |
| Course Learning Outcomes (for Mapping with PO's and PSO's) | |
| On completion of the course the students should be able to | |
| CO1: summarize the properties of fuels which include petroleum, water gas, natural gas and propellents. | |
| CO2: evaluate cosmetic products, soaps, detergents. | |
| CO3: explain manufacture of sugar, food spoilages and food additives. | |
| CO4: explain properties of abrasives, manufacture of leather and paper. | |
| CO5: explain properties and manufacture of lubricants and cement, and intellectual property rights. | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

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|-------------------------------------|---|-----------------|---------------------|----------------|---|--------------------|--|
| Title of the Course | PHARMACEUTICAL CHEMISTRY | | | | | | |
| Paper No. | Elective Course VI B | | | | | | |
| Category | Elective | Year | III | Credits | 3 | Course Code | |
| | | Semester | VI | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | | Total | |
| | 4 | | - | | | 4 | |
| Prerequisites | Knowledge on active chemical compounds and biochemistry | | | | | | |

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| Objectives of the course | <p>The course aims at providing an overall view of</p> <ul style="list-style-type: none"> • Drugs design and drug metabolism • Important Indian medicinal plants, common diseases and antibiotics |
| | <ul style="list-style-type: none"> • Drugs for major diseases like cancer, diabetes and AIDS • Analgesics and antipyretic agents • Significance of clinical tests |
| Course Outline | <p>UNIT- I</p> <p>Introduction Important terminologies – drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, actinomycetes, vaccines, pharmacopeia, posology and therapeutic index.</p> <p>Sources of drugs–dosage forms–bioavailability–routes of administration – absorption, distribution and elimination of drugs–drug metabolism–prescription terms.</p> <p>Structure and pharmacological activity Effect of – unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.</p> <p>Development of Drugs Development of a drug– classic steps- lead compounds- comparison of traditional and modern methods of development to drugs–drug design By method of variation–disjunction and conjunction methods.</p> <hr/> <p>Unit- II</p> <p>Indian medicinal plants Some important Indian medicinal plants–tulsi, neem, kizhanelli, mango, semparuthi, adadodai, turmeric and thoothuvalai –uses.</p> <p>Common diseases and their treatment Causes, prevention and treatment of the following diseases: Insect borne diseases– malaria, filariasis, plague; Air borne diseases– diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis; Water borne diseases–cholera, typhoid, dysentery. Digestive system – jaundice; Respiratory system – asthma; Nervous system – epilepsy.</p> <p>Antibiotics Definition – classification – structure and therapeutic uses of chloramphenicol, penicillins, structure activity relationship of chloramphenicol ; therapeutic uses of ampicillin, streptomycin, erythromycin, tetracycline, rifamycin.</p> |

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| | <p>UNIT- III Drugs for major diseases Cancer – common causes – chemotherapy – anti neoplastic agents - classification –adverse effects of cytotoxic agents ; alkylating agents–chlorambucil; antimetabolites– methotrexate, fluouracil; Vinca alkaloids– vincristine, vinblastine. Diabetes– types–</p> |
| | <p>Management of diabetes–insulin ;oral hypoglycemic agents- sulphonyl ureas – chlorpropamide; biguanides -metformin – thiazolidinediones .Cardiovascular drugs– cardio glycosides ; anti arrhythmic agents – quinidine, propranolol hydrochloride ; anti-hypertensive drugs - Aldomet, pentoliniumtartarate; vasodilator-tolazolinehydrochloride, sodiumnitro prusside. AIDS–causes, symptoms and prevention–anti HIV drugs-AZT,DDC.</p> <p>UNIT- IV Analgesics and anti pyreticagents Classification – action of analgesics – narcotic analgesics –morphine; synthetic analgesics – pethidine, methadone; antipyretic analgesics – salicylic acid derivatives, indolyl derivatives, p-aminophenol derivatives.</p> <p>Anaesthetics Definition,characteristics,classification-generalanaesthetics–volatile anaesthetics – nitrous oxide, ethers, cyclopropane, chloroform, halothane, trichloroethylene–storage, advantages and disadvantages; non volatile anaesthetics – thiopental sodium ; local anaesthetics – requisites – advantages- esters – cocaine, benzocaine ; amides – lignocaine, cinchocaine.</p> <p>Blood and haematological agents Blood– composition, grouping – physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, protamine sulphate, dry thrombin; Anti coagulants – coumarins, citric acid and heparin; antifibrinolytic agents – aminocaproic acid and tranexamic acid. Anaemia–causes, types and control–antianaemic drugs.</p> <p>UNIT-V Clinical Chemistry Blood tests–blood count–complete haemotogram – Hb, RBC, GTT, TC, DC, platelets, PCV, ESR; bleeding and clotting time--glucose tolerance test. Significance of Clinical Tests Serum electrolytes- blood Glucose-ortho toluidine method; Renal functions tests - blood urea, creatinine; liver function tests - serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronaryriskindex. Urineexamination–pH,testsforglucose,albuminandbile pigment.</p> |
| <p>Extended Professional Component(is a</p> | <p>Questions related to the above topics ,from various competitive Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |

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| Part of internal 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 | <ol style="list-style-type: none"> 1. Jayashree Ghosh, (1999), A text book of pharmaceutical chemistry, 2nded., S.Chand & company, New Delhi. 2. Lakshmi S, (2004), Pharmaceutical chemistry, 3rded., Sultan chand & sons, Delhi. 3. Tripathi KD, (2018), Essentials of medical pharmacology, 8thed., Jaypee brothers medical publishers (P) Limited, New Delhi. 4. Ashutosh Kar, (2018), Medicinal chemistry, 7thed., Newage international (P) Limited, Publishers, New Delhi. |
| Reference Books | <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I) 6thed., Himalaya Publishing house, Bombay. 2. Chatwal G R, (1991), Pharmaceutical chemistry, organic (vol-II), Himalaya publishing house, Bombay. 3. Patrick G, (2002), Instant Notes Medicinal Chemistry, Viva Books Private Limited, New Delhi. 4. Intellectual Property Rights, Neeraj Pandey, Khushdeep Dharni. Publisher: PHI Learning Pvt. Ltd., 2014 ISBN: 812034989X, 9788120349896. |
| Website and e-learning source | <ol style="list-style-type: none"> 1. http://www.pharmacy.umaryland.edu/faculty/amackere/courses/phar531_delete/lectures/qsar_1.pdf 2. http://www.indianmedicinalplants.info/ 3. https://www.wipo.int/about-ip/en/ |

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

CO1: Define the pharmaceutical terminologies; describe the principles in pharmacological activity, drug development, clinical chemistry, hematology, the therapeutic drugs and treatment of diseases; list the types of IPR and trademarks.

CO2: Discuss the development of drugs, structural activity, disease types, physio-chemical properties of therapeutic agents, significance of medicinal plants, clinical tests and factors for patentability.

CO3: Apply the principles involved in structural activity and drug designing, functions of hematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.

CO4: explain classification of analgesics and anesthetics, and physiological functions of plasma proteins

CO5: explain the significance of clinical tests like blood urea, serum proteins and coronary risk index

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

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|-------------------------------------|---|-----------------|---------------------|----------------|----------|--------------------|--|
| Title of the Course | *APPLIED CHEMISTRY | | | | | | |
| Paper No. | Naan Mudhalvan (substitute) | | | | | | |
| Category | Elective | Year | III | Credits | 2 | Course Code | |
| | | Semester | VI | | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | | Total | |
| | 2 | | - | | | 2 | |
| Prerequisites | Knowledge on active chemical compounds. | | | | | | |
| Objectives of the course | <p>The Primary objectives of this course are to</p> <ul style="list-style-type: none"> • Gain knowledge on fuels. • Study about industrially important compounds. • Acquire knowledge about basic needs of Agriculture developments. • Learn the substances useful for human life. • Study on Match and Silicate Industries. | | | | | | |
| Course Outline | <p>UNIT- I FUEL CHEMISTRY Fuels- Definition-Classification - Combustion and Chemical Principles - Calorific value-Characteristics of a good fuel.Solid fuel: Coal - Types - Cross and Net calorific values- Proximate and Ultimate analysis of coal - High and low temperature of carbonization - Uses. Liquid fuels: Petroleum and its Chemical Composition- Cracking of heavy oil residues- Thermal and catalytic cracking, Knocking, Anti-knocking and Chemical structure, Octane and Cetane numbers - Significance - Petroleum products and their applications. Gaseous fuels: Preparation and Specific uses of Producer gas, Water gas, LPG and Gobar gas. Advantages and Disadvantages of Solid, Liquid and Gaseous fuels. Rocket fuels- Classification of Solid Propellants, Liquid Propellants'- Combustion -Spontaneous ignition temperature (SIT) - Combustion calculation. UNIT- II: PAINTS, LUBRICANTS, ADHESIVES AND PIGMENTS Paints: Classification- Primary constituents, Manufacturing of paints, Emulsion paint- Constituent and advantages-Latex paints and Fire retardant paints, Solvents and Thinners. Lubricants: Functions of lubricants-Properties and Classifications - Additives for lubricating oil, Lubricants of mineral origin. Lubricating grease and Solid lubricants. Adhesives: Classification and preparation of adhesives. Synthetic resin adhesives and Rubber based adhesives -Uses of adhesives. Pigments: Characteristics and uses of TiO₂, Ultramarine Blue and Red lead. UNIT - III :AGRICULTURAL CHEMISTRY Fertilizers: Raw material, manufacture (flow chart)- Chemical process (with equation) of ammonium nitrate, ammonium sulphate, urea, ammonium phosphate, super phosphate, triple super phosphate, NPK fertilizers. Pesticides: Classification of pesticides, examples. Insecticides: Stomach poisons, Contact insecticides, Fumigants, Manufacture and uses of Insecticides: DDT, BHC, Pyrethrin, Aldrin and Pentachlorophenol. Fungicides: Bordeaux mixture, Lime sulphur, Creosote oil.</p> | | | | | | |

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| | <p>UNIT- IV: OILS, SOAPS AND DETERGENTS Oils: Definition: Fats and Oils- Constituents- Sources-Difference between oils and fats, Manufacture of Cotton seed oil, Sunflower oil and Soyabean oil. Soaps: Definition, Manufacture of soaps- Types of soaps -Specific uses. Detergents: Difference between soaps and detergents, Synthetic detergents- Surface active agents and their classification- Anionic, Cationic and Non - ionic detergents - Applications including cleaning action. UNIT- V :MATCH AND SILICATE INDUSTRIES Match Industry; Types of Matches- Composition of match head and striking surface- Manufacture of safety matches-Coloured matches- Pyrotechniques and explosives, Classification of good explosives TNT, RDX ,Gun powder, Ammonium nitrate. Silicate industry; Cement: Types of cements, composition, manufacture of Portland cement and Setting of cement. Ceramics: Introduction, Types, Manufacture, and Applications, Refractory materials. Glass: Definition, Composition, Types, Manufacturing of glass products, Physical and Chemical properties, Applications.</p> |
| Extended Professional Component(is a Part of internal Component only, Not to be included In the external examination Question paper) | Questions related to the above topics ,from various competitive Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <p>Text Books 1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2003. 2. James A. Kent, Riegel's Hand book of Industrial Chemistry, Springer Science, 2013.</p> |

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| Reference Books | Reference Books 1. C.E. Dryden, Outlines Chemical Technology, Gopala Rao, East west Press, New Delhi 2. S. Johnson, N.Saikia, Fatty acids Profile of edible oils and fats in India, Centre for Science and Environment, New Delhi, India. |
| Website and e-learning source | http://fazaia.edu.pk - Library |
| Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to | |
| <p>CO1: Define fuels and explain various types of fuels.</p> <p>CO2: choose the suitable paints, pigments, lubricants and adhesives for day to day life activities.</p> <p>CO3: analyse the highly useful fertilizers, pesticides, insecticides and fungicides to improve crop yield.</p> <p>CO4: discuss the oils ,soaps and detergents which are necessary for health and other activities.</p> <p>CO5: outline the industrially important compounds for the human development activities.</p> | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

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|------------------------------|--|----------|--------------|---------|-------|-------------|
| Title of the Course | ORGANIC CHEMISTRY-II | | | | | |
| Paper No. | Core – XIII | | | | | |
| Category | Core | Year | III | Credits | 3 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | 1 | - | | 5 | |
| Pre requisites | Organic Chemistry – I | | | | | |
| Objectives of the course | <p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • classification, isolation and discussing the properties of alkaloids and terpenes. • preparation and properties of saccharides. • Biomolecules. • different molecular rearrangement • preparation and properties of organometallic compounds | | | | | |
| Course Outline | <p>UNIT- I Alkaloids Classification, isolation, general properties-Hofmann Exhaustive Methylation; Structure elucidation –Coniine, piperine, nicotine.</p> <p>Terpenes: Classification, Isoprenerule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.</p> | | | | | |

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| | <p>UNIT- II Carbohydrates Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.</p> <p>Monosaccharides—configuration—D and L hexoses –aldohexoses and ketohexoses. Glucose, Fructose—Occurrence, preparation, properties, reactions, structural elucidation, uses. Interconversions of sugar series –ascending, descending, aldose to ketose and ketose to aldose.</p> <p>Disaccharides—sucrose, lactose, maltose- preparation, properties and uses (no structural elucidation).</p> <p>Polysaccharides—Source, constituents and biological importance of homo polysaccharides –starch and cellulose, hetero polysaccharides— Hyaluronic acid, heparin.</p> |
| | <p>UNIT- III Molecular rearrangements: Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Claisen, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement</p> <hr/> <p>UNIT-IV Special reagents in organic synthesis AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TBHP, TEMPO</p> <p>Organometallic compounds in Organic Synthesis Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler–Natta, Wilkinson, Metal Carbonyl, Zeiss's Salt</p> <hr/> <p>UNIT –V Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media—green solvents, green reagents and catalysts; tools used like micro wave and ultra-sound in chemical synthesis.</p> |
| Extended Professional | Questions related to the above topics, from various competitive Examinations UPSC/JAM/TNPSC others to be solved |

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| Component(is a Part of internal component only, Not to be included In the external examination Question paper) | (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 | <ol style="list-style-type: none"> 1 M.K.Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, 4th reprint, 2009. 2 S.M.Mukherji, and S.P.Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rd edition, 2009 3 Arun Bahl and B.S.Bahl, Advanced organic chemistry, New Delhi, S.Chand & Company Pvt. Ltd., Multi colour edition, 2012. 4 P.L.Soni and H.M.Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007. |

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| | 5.C Bandyopadhyaya; An Insight into Green Chemistry; Published on 2020 |
| Reference Books | <ol style="list-style-type: none"> 1. R.T.Morrison and R.N.Boyd, Organic Chemistry, Pearson Education, Asia, 6th edition,2012. 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, 11th edition, 2012. 3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi,7thedition,2009. 4. I.L.Finar, Organic Chemistry ,Vol.(1&2) ,England, Wesley Longman Ltd, 6th edition, 2006. 5. J.A.Joule, and G.F.Smith,HeterocyclicChemistry,Wiley,5th Edition, 2010. |
| Website and e-learning source | <ol style="list-style-type: none"> 1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in 4. Virtual Textbook of Organic Chemistry 5. https://vlab.amrita.edu/ |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</p> <p>CO1: explain isolation and properties of alkaloids and terpenes. CO2: explain preparation and reactions of mono and disachharides. CO3: classify biomolecules and natural products based on their structure, properties, reactions and uses. CO4:explain molecular rearrangements like benzdine, Hoffmann etc., CO5:preparation and properties of organo lithium compounds</p> | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--------|------|------|------|------|------|
|--------|------|------|------|------|------|

| | | | | | |
|---|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weight age | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| | | | | | | |
|------------------------------|---|----------|--------------|---------|-------|-------------|
| Title of the Course | INORGANIC CHEMISTRY-II | | | | | |
| Paper No. | Core-XIV | | | | | |
| Category | Core | Year | III | Credits | 3 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | 1 | - | | 5 | |
| Prerequisites | Inorganic Chemistry-I | | | | | |
| Objectives of the course | <p>The course aims to provide knowledge on</p> <ul style="list-style-type: none"> • tracer elements and their role in the biological system. • Iron transport and storage • Metallo enzymes, oxygen transport. • silicates and their applications • industrial applications of refractories, alloys, paints and pigments | | | | | |
| Course Outline | <p>UNIT-I Bio inorganic Chemistry Essential and trace elements: Role of Na⁺, K⁺, Mg²⁺, Ca²⁺, Fe³⁺, Cu²⁺ and Zn²⁺ in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.</p> | | | | | |
| | <p>UNIT-II Metal ion transport and storage Iron – storage, transport - Transferrin and Ferritin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage-copper and zinc.</p> | | | | | |
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| | <p>UNIT- III Metallo enzymes</p> <p>Isomerase and synthetases, structure of cyanocobalamin (VitaminB12), nature of Co-C bond; Metallo enzymes - functions of carboxy peptidase A, zinc metallo enzyme – mechanism and uses, Zn-Cu enzyme – structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation–biological functions of nitrogenase and molybdo enzymes.</p> <p>UNIT- IV Silicates</p> <p>Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)</p> <p>UNIT- V Industrial Applications of Inorganic Compounds</p> <p>Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses.</p> <p>Industrial visits and internship are mandatory.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |
| <p>Recommended Text</p> | <p>1.PuriBR ,SharmaL R, KaliaKC (2011), Principles of Inorganic Chemistry, 31th ed., Milestone Publishers & Distributors, Delhi.</p> |

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|--|--|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| | <ol style="list-style-type: none"> 2. Satya Prakash, Tuli G.D., Basu S.K., Madan R.D.(2009),Advanced Inorganic Chemistry, 18th Edition, S.Chand & Co., NewDelhi 3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London. 4. WVMalik, GDTuli, RDMadan,(2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd. 5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992 | | | | | | | | | |
| Reference Books | <ol style="list-style-type: none"> 1. Madan RD, Sathya Prakash ,(2003), Modern Inorganic Chemistry, 2nd ed., S.Chand and Company, New Delhi. 2. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u>, Ist Edition, University Press (India)Private Limited, Hyderabad 3. Sivasankar B, (2013) <u>Inorganic Chemistry</u> .Ist Edition, Pearson, Chennai 4. AlanG.Sharp (1992), <u>Inorganic Chemistry</u>, 3rd Edition, Addition-Wesley, England 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition,2014. | | | | | | | | | |
| Website and e-learning source | <ol style="list-style-type: none"> 1. www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http://swayam.gov.in | | | | | | | | | |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</p> <p>CO1: ability to explain the importance of tracer elements on biological system.</p> <p>CO2: explain the metal ion transport, Bohr effect, Na, K, Ca pump.</p> <p>CO3: explain the function of VitaminB12, Zn-Cu enzyme, ferredoxin, cluster enzymes.</p> <p>CO4: classification and structure of silicates..</p> <p>CO5: explain the manufacture of refractories, explosives, paints and pigments.</p> | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |

| | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

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

Level of Correlation between PSO's and CO's

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|------------------------------|---|----------|--------------|---------|-------|-------------|
| Title of the Course | PHYSICAL CHEMISTRY-II | | | | | |
| Paper No. | Core-XV | | | | | |
| Category | Core | Year | III | Credits | 3 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | 1 | - | | 5 | |
| Prerequisites | Physical Chemistry- II | | | | | |
| Objectives of the course | <p>The course aim at providing an overall view of the</p> <ul style="list-style-type: none"> • phase diagram of one and two component systems • chemical equilibrium, • separation techniques for binary liquid mixtures. • Electrical conductance and transport number. • Galvanic cells, EMF and significance of electrochemical series. | | | | | |
| Course Outline | UNIT-I Phase rule Definition of terms; derivation of phase rule ; application to one component systems–water and sulphur- super cooling, sublimation; two component systems–solid liquid equilibria –simple eutectic(lead- silver and bismuth - cadmium), freezing mixtures (potassium iodide-water), compound formation with- congruent melting points (magnesium–zinc and ferric chloride–water system), peritectic | | | | | |
| | change(sodium–potassium), Solid solution(gold-silver);copper sulphate– water system. | | | | | |

UNIT -II**Chemical equilibrium**

Law of mass action–thermodynamic derivation–relationship between K_p and K_c –application to the homogeneous equilibria – dissociation of PCl_5 gas, N_2O_4 gas –equilibrium constant and degree of dissociation - formation of HI, NH_3 , and SO_3 –heterogeneous equilibrium – decomposition of solid calcium carbonate–Le chatelier principle –van't Hoff reaction isotherm–temperature dependence of equilibrium constant – van't Hoff reaction isochore – Clayperon equation – Clausius Clayperon equation and its applications

UNIT- III**Binary liquid mixtures**

Ideal liquid mixtures–non ideal solutions–azeotropic mixtures–Fractional distillation–partially miscible mixtures–phenol-water, Tri ethyl amine-water, nicotine-water–effect of impurities on critical solution temperature; immiscible liquids- steam distillation; Nernst Distribution law–applications.

UNIT-IV**Electrical Conductance and Transference**

Arrhenius theory of electrolytic dissociation – Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes – interionic effects – Debye Huckel theory –Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhagen effect, Wien effect. Ionic mobility – Discharge of ions on electrolysis (Hittorf's theoretical device), transport number–determination–Hittorf's method, moving boundary method–factors affecting transport number – determination of ionic mobility; Kohlrausch's law- applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements–determination of-degree of dissociation of weak electrolyte, dissociation constant of weak acid and weak base, ionic product of water, solubility and solubility product of sparingly soluble salts-conductometric titrations–acid base titrations.

UNIT-V**Galvanic Cells and Applications**

Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, Thermodynamics and EMF–calculation of ΔG , ΔH , and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes–metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series – applications of electro chemical series. Chemical cells with and without transport, concentration cells with and without transport;

Applications of EMF measurements

Applications of EMF measurements–determination of activity

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| | <p>Coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations – acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis; redox indicators - use of diphenylamine indicator in the titration of ferrous iron against dichromate.</p> <p>Industrial component Galvanic cells-lead storage, Ni-Cd, Li and Zn-air, Al-air batteries Fuel cells – H₂-O₂cell – efficiency of fuel cells. corrosion –mechanism, types and methods of prevention.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |
| <p>Recommended Text</p> | <ol style="list-style-type: none"> 1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. 2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. 3. Arun Bahl, B.S.Bahl, G.D.Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. 4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. 5. J.Rajaram and J.C.Kuriacose, Thermodynamics, Shoban Lal Nagin Chand and CO., 1986. |
| <p>Reference Books</p> | <ol style="list-style-type: none"> 1. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition, 2009. 2. Gilbert.W. Castellen, Physical Chemistry, Narosa Publishing House, third edition, 1985. 3. P. W. Atkins, and Juliode Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. 4. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 5. D.N. Bajpai, Advanced Physical Chemistry, S.Chand & Co., 2001 |

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| Website and e-learning source | https://nptel.ac.in https://swayam.gov.in https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_07_m.pdf Thermodynamics - NPTEL https://www.youtube.com/watch?v=f0udxGcoztE Introduction to chemical equilibrium – MIT open course ware |
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Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to

CO1: construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and solid solutions.

CO2: apply the concepts of chemical equilibrium in dissociation of PCl_5 , N_2O_4 and formation of HI , NH_3 , SO_3 and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation.

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

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

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

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

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

Level of Correlation between PSO's and CO's

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|-------------------------------------|--|-----------------|---------------------|--------------|--------------|--------------------|
| Title of the Course | PHYSICAL CHEMISTRY PRACTICAL | | | | | |
| Paper No. | Core –XVI | | | | | |
| Category | Core | Year | III | Credi | 3 | Course Code |
| | | Semester | VI | ts | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | - | - | 3 | | 4 | |
| Prerequisites | Theoretical knowledge on physical chemistry | | | | | |
| Objectives of the course | This course aims at providing <ul style="list-style-type: none"> • Basic principles of physical chemistry experiments • Hands on experience in carrying out the experiments | | | | | |
| Course Outline | <p>UNIT-I Thermometric experiments 1. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent 2. Determination of molecular weight of organic compound by transition temperature method. 3. Simple eutectic-determination of eutectic temperature and composition of naphthalene- Diphenyl amine or naphthalene-diphenyl system. 4. Determination of upper critical solution temperature of phenol– water system; Study the effect of impurity on CST and determination of the strength of unknown.</p> <p>UNIT -II Chemical kinetics 5. Determination of rate constant of acid catalyzed hydrolysis of an ester - methylacetate. 6. Determination of order of reaction between iodide and persulphate (initial rate method). 7. Polarimetry: Determination of rate constant of acid catalysed inversion of cane sugar</p> <p>Thermo chemistry 8. Determination of heat of neutralization of a strong acid by a strong base. 9. Determination of heat of hydration of copper sulphate.</p> <p>UNIT -III Electrochemistry–Conductance measurements 10. Conductometric titration of hydrochloric acid against sodium hydroxide 11. Potentiometric titration of ferrous ion against potassium dichromate using quinhydrone electrode.</p> <p>Adsorption 12. Construction of Freundlich isotherm for the adsorption of acetic acid on activated charcoal.</p> | | | | | |

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| | <p>Experiments for demonstration:</p> <p>Distribution law</p> <ol style="list-style-type: none"> 1. Determination of the distribution co-efficient of iodine between carbon tetrachloride and water. 2. Determination of equilibrium constant of the reaction $I_2 + I^- \rightleftharpoons I_3^-$ <ol style="list-style-type: none"> 3. Determination of concentration of the given potassium iodide solution using the above equilibrium constant. <p>Electrochemistry</p> <ol style="list-style-type: none"> 4. Determination of cell constant and molar conductance of strong electrolyte. 5. Determination of dissociation constant of acetic acid. <p>Colorimetry</p> <ol style="list-style-type: none"> 6. Determination of concentration of copper sulphate solution. |
| Extended Professional Component (is a Part of internal Component only, Not to be included In the external examination Question paper) | Questions related to the above topics, from various competitive Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Reference Books | <ol style="list-style-type: none"> 1. Sindhu, P.S. <i>Practicals in Physical Chemistry</i>, Macmillan India : New Delhi, 2005. 2. Khosla, B. D. Garg, V. C.; Gulati, A. <i>Senior Practical Physical Chemistry</i>, R. Chand : New Delhi, 2011. 3. Gupta, Renu, <i>Practical Physical Chemistry</i>, 1st Ed.; New Age International : New Delhi, 2017. |
| Website and e-learning source | https://www.vlab.co.in/broad-area-chemical-sciences |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</p> <p>CO1: Describe the principles and methodology for the practical work.</p> <p>CO2: Explain the procedure, data and methodology for the practical work</p> <p>CO3: Apply the principles of phase rule and electrochemistry for carrying out the practical work</p> <p>CO4: Demonstrate laboratory skills for safe handling of the equipment and chemicals</p> | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

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|-------------------------------------|---|----------------------|---------------------|----------------|----------|--------------------|--|
| Title of the Course | FUNDAMENTALS OF SPECTROSCOPY | | | | | | |
| Paper No. | EC-VII A | | | | | | |
| Category | Elective Course | Year Semester | III VI | Credits | 3 | Course Code | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | | Total | |
| | 4 | | - | | | 4 | |
| Prerequisites | General Chemistry I, II ,III and IV | | | | | | |
| Objectives of the course | <p>This course is designed to provide knowledge on</p> <ul style="list-style-type: none"> • Electrical and magnetic properties of organic and inorganic compounds • Basic principles of microwave ,UV-Visible ,infrared, Raman, NMR and Mass spectrometry • Instrumentation of microwave, UV-Visible, infrared, Raman, NMR and Mass spectrometry • applications of various spectral techniques in structural elucidation • solving combined spectral problems | | | | | | |
| Course Outline | <p>UNIT-I Electrical and Magnetic properties of molecules Dipole moment – polar and non-polar molecules – polarisability of molecules. Application of dipole moments in the study of organic and inorganic molecules. Magnetic permeability, volume susceptibility, mass susceptibility and molar susceptibility; diamagnetism, paramagnetism– determination of magnetic susceptibility using Guoy balance, ferromagnetism, anti ferromagnetism Microwave spectroscopy Rotation spectra- diatomic molecules (rigid rotator approximation) selection rules–determination of bond length, effect of isotopic substitution–instrumentation and applications</p> <hr/> <p>UNIT-II Ultraviolet and Visible spectroscopy Electronic spectra of diatomic molecules (Born Oppenheimer approximation) -vibrational coarse structure–rotational fine structure of electronic vibration transitions – Frank Condon principle – dissociation in electronic transitions – Birge Sponer method of evaluation of dissociation energy–pre-dissociation transition-σ-σ^*, π-π^*,n-σ^*, n-π^* transitions. Applications of UV-Woodward – Fieser rules as applied to conjugated dienes and α, β-unsaturated ketones. Elementary Problems. Colorimetry –principle and applications(estimation of Fe^{3+})</p> <hr/> <p>UNIT-III</p> | | | | | | |

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| | <p>Infra red spectroscopy Vibration spectra–diatomic molecules–harmonic oscillator and An harmonic oscillator; Vibration–rotation spectra–diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer Approximation oscillator)-selection rules, vibrations of polyatomic molecules–stretching and bending vibrations–applications– Determination of force constant ,moment of inertia and internuclear distance–isotopic shift–application of IR spectra to simple organic And inorganic molecules –(group frequencies)</p> <p>Raman Spectroscopy Rayleigh scattering and Raman scattering of light–Raman shift– Classical theory of Raman effect–quantum theory of Raman effect– Vibrational Raman spectrum–selection rules–mutual exclusion principle–instrumentation (block diagram)–applications.</p> <hr/> <p>UNIT-IV Nuclear magnetic resonance spectroscopy:</p> <p>PMR–theory of PMR–instrumentation–number of signals–chemical shift–peak areas and proton counting–spin-spin coupling– applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple Mono functional organic compounds; spin-spin splitting of neighbouring Protons in vinyl and allyl systems.</p> <hr/> <p>UNIT-V Mass spectrometry Principle–different kinds of ionisation–instrumentation–the mass spectrum–types of ions–determination of molecular formula- Fragmentation and structural elucidation–Mc Lafferty rearrangement; Retro Diels Alder reaction- illustrations with simple organic molecules.</p> <p>Solving structure elucidation problems using multiple spectroscopic Data (NMR, MS, IR and UV-Vis).</p> |
| <p>Extended Professional Component(is a Part of internal Component only, Not to be included In the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |

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| Recommended Text | <ol style="list-style-type: none"> 1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. <i>Elements of Analytical Chemistry</i>; S Chand: New Delhi, 2003. 2. Usharani, S. <i>Analytical Chemistry</i>, 1sted.; Macmillan:India, 2002. 3. Banwell, C.N.; McCash, E. M. <i>Fundamentals of Molecular Spectroscopy</i>, 4thed.; Tata McGraw Hill, New Delhi, 2017. 4. U.N.Dash, <i>Analytical Chemistry Theory and Practice</i>, Sultan Chand & Sons, 2nd Ed., 2005 5. B.K.Sharma, <i>Spectroscopy</i>, 22nded., Goel Publishing House, 2011. |
| Reference Books | <ol style="list-style-type: none"> 1. Srivastava, A.K.; Jain, P.C. <i>Chemical Analysis and Instrumental Approach</i>, 3rded.; S.Chand, New Delhi, 1997. 2. Robert D Braun. <i>Introduction to Instrumental Analysis</i>; Mc.Graw Hill: New York, 1987. 3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. <i>Fundamentals of Analytical Chemistry</i>, 9thed.; Har court college Publishers: USA, 2013. 4. Madan, R.L.; Tuli, G.D. <i>Physical Chemistry</i>, 2nded.; S.Chand: New Delhi, 2005. 5. Puri, B.R.; Sharma, L.R.; Pathania, M.S. <i>Principles of Physical Chemistry</i>, 43rded.; Vishal Publishing: Delhi, 2008. |
| Website and e-learning source | <ol style="list-style-type: none"> 1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf 2. http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html 3. www.epgpathshala.nic.in 4. www.nptel.ac.in 5. http://swayam.gov.in |
| <p>Course Learning Outcomes (for Mapping with Pos and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO1: explain electrical and magnetic properties of materials and microwave spectroscopy CO2: explain theory, instrumentation and applications of Infrared and Raman spectroscopy CO3: apply selection rules to understand spectral transitions, explain Woodward–Fieser’s Rule for the calculation of wavelength maximum of conjugated dienes</p> <p>CO4: explain theory, instrumentation and applications of NMR spectroscopy</p> <p>CO5: explain theory, instrumentation and applications of Mass spectrometry</p> | |

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

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

Level of Correlation between PSO's and CO's

| | | | | | | |
|-------------------------------------|---|-----------------|---------------------|----------------|--------------|--------------------|
| Title of the Course | CHEMISTRY IN MEDICINE | | | | | |
| Paper No. | ECV-II B | | | | | |
| Category | Elective Course | Year | III | Credits | 3 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | 1 | - | | 4 | |
| Prerequisites | Organic Chemistry | | | | | |
| Objectives of the course | <p>This course is designed to provide knowledge on</p> <ul style="list-style-type: none"> To have knowledge of first aid and the important rules. To know the common chemicals in medicine. To have awareness of common diseases. To learn the diagnostic tests and to know the importance of vitamins. | | | | | |

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| <p>Course outline</p> | <p>Unit-1: FIRST AID First Aid for accidents - important rules-first aid kit, First aid for cuts, bruises, bleeding, fractures, burns, fainting and poisonous bites. Common poisons Acid poisoning-antidote, Alkali poisoning-antidote, Poisoning by disinfectant-symptoms antidote, Alkaloid poisoning-symptoms-antidote, alcohol poisoning - symptoms - antidote, Mercury poisoning-antidote and Salicylate poisoning-antidote.</p> |
| <p>Extended Professional Component (is a Part of internal Question paper)</p> | <p>Unit-II: CHEMICALS IN MEDICINE (Preparations and chemical equations not required) Alum - properties and uses - Aluminium hydroxide gel - uses - Dried Aluminium hydroxide gel - uses - Aluminium acetate - uses - Ferrous fumarate uses Ferric ammonium citrate uses. Ferrous gluconate uses, Ferrous sulphate. Biological importance of sodium, potassium, calcium, Iodine and copper. Unit-III: CAUSES AND TREATMENT OF SOME COMMON DISEASES Insect borne diseases - malaria and filariasis - Prevention and treatment. Air borne diseases - diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis and leprosy - Prevention and treatment. Water borne diseases - cholera, typhoid and diarrhoeal diseases Prevention and treatment. Respiratory disorder - Prevention and treatment of asthma. Nervous disorder - epilepsy - Prevention and treatment - other diseases - Peptic ulcer - treatment. Unit-IV: CLINICAL CHEMISTRY Clinical chemistry-Composition of blood - blood grouping - determination of blood groups and matching - blood pressure - hypertension - determination. Determination of glucose in serum - Folin and Wu's method - determination of serum cholesterol - Sackett's method - tests for cholesterol. Estimation of glucose in urine - Diagnostic test for sugar in urine Benedict's test - Clinistix strip test Diagnostic test for salts in and serum. Detection of diabetes, detection of anaemia. Estimation of hemoglobin (Hb concentration) - estimation of red blood cells - Normal RBC count in adults. Unit-V: HEALTH CARE MEDICINES Vitamins - Classification of Vitamins - Sources - deficiency diseases of Vitamins A, D, E, K, B₁, B₂, B₃, B₆ and C - Therapeutic uses. Treatment of ulcers and skin diseases.</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |

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| Recommended Text | <ol style="list-style-type: none"> Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. <i>Elements of Analytical Chemistry</i>; S Chand: New Delhi, 2003. Usharani, S. <i>Analytical Chemistry</i>, 1sted.; Macmillan: India, 2002. Banwell, C.N.; Mc Cash, E. M. <i>Fundamentals of Molecular Spectroscopy</i>, 4thed.; Tata McGraw Hill, New Delhi, 2017. U.N. Dash, <i>Analytical Chemistry Theory and Practice</i>, Sultan Chand & Sons, 2nd Ed., 2005 B.K. Sharma, <i>Spectroscopy</i>, 22nded., Goel Publishing House, 2011. |
| Reference Books | <ol style="list-style-type: none"> Srivastava, A.K.; Jain, P.C. <i>Chemical Analysis and Instrumental Approach</i>, 3rded.; S.Chand, New Delhi, 1997. Robert D Braun. <i>Introduction to Instrumental Analysis</i>; Mc.Graw Hill: New York, 1987. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. <i>Fundamentals of Analytical Chemistry</i>, 9thed.; Har court college Publishers: USA, 2013. Madan, R.L.; Tuli, G.D. <i>Physical Chemistry</i>, 2nded.; S.Chand: New Delhi, 2005. 10.Puri, B.R.; Sharma, L.R.; Pathania, M.S. <i>Principles of Physical Chemistry</i>, 43rded.; Vishal Publishing: Delhi, 2008. |
| Website and e-learning source | <ol style="list-style-type: none"> http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupTheory.html 6. www.epgpathshala.nic.in 7. www.nptel.ac.in 8. http://swayam.gov.in |
| <p>Course Learning Outcomes (for Mapping with Pos and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO1: explain the first aid for accident and common poison.</p> <p>CO2: explain the chemicals in medicine.</p> <p>CO3: apply the knowledge for causes and treatment of common diseases.</p> <p>CO4: explain the various clinical test.</p> <p>CO5: explain the importance of vitamins.</p> | |

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| | | | | | | |
|------------------------------|---|----------|--------------|----------|-------|-------------|
| Title of the Course | POLYMER SCIENCE | | | | | |
| Paper No. | EC-VIII A | | | | | |
| Category | Elective | Year | III | Credit s | 3 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | | | | 5 | |
| Prerequisites | Knowledge on polymers, polymerization and characterisation | | | | | |
| Objectives of the course | <p>The course aims at providing an overall view of</p> <ul style="list-style-type: none"> • Classification of polymers, preparation of polymers • Kinetics of polymerization and characterization of polymers • Analytical techniques used to characterize polymers • Reactions of polymers • Speciality polymers like PVC, PMMA | | | | | |
| Course Outline | <p>UNIT- I Introduction Difference between polymer and macromolecule–classification–Synthetic and natural, organic and inorganic, thermoplastic and thermosetting. Plastics, elastomers, fibres and liquid resins.</p> <p>Techniques of polymerization Bulk, solution, emulsion and suspension polymerization</p> | | | | | |

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| | <p>Unit-II Kinetics of polymerization Kinetics of condensation and addition polymerisation; ionic, free radical, copolymerization and coordination polymerisation–reactivity Ratios –block and graft copolymers. Characterisation of polymers Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical, Thermo mechanical and rheological properties of polymers in Visco elastic state.</p> |
| | <p>UNIT-III Molecular Weight and Properties of Polymers Molecular Weight of Polymers-Number Average and Weight Average, Molecular Weight Distribution, Determination of Molecular Weight poly dispersity index – membrane and vapour phase osmometry, light scattering - Zimmplot, ultracentrifuge–sedimentation velocity and sedimentation equilibrium–viscometry–gel permeation chromatography Thermal properties of polymers–Glass Transition Temperature-State of Aggregation and State of Phase Transitions, Factors Influencing Glass Transition Temperature, Importance of Glass Transition Temperature, Heat Distortion Temperature, TGA / DTA, Crystallinity of Polymers: Crystalline Behaviour, Degree of Crystallinity</p> |
| | <p>UNIT -IV Reactions of Polymers- Hydrolysis, Acidolysis, Aminolysis, Addition and Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific Functional Groups in the Polymer Polymer technology Processing of polymers–casting, thermoforming, moulding–extrusion, compression, blow moulding– foaming, lamination, reinforcing –processing of fibres–melt, wet and dry spinning.</p> |
| | <p>UNIT- V Speciality polymers Poly electrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electro luminescent polymers–two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber. Polymer Degradation Types of Degradation-Thermal, Mechanical, Ultrasound, Photo</p> |
| | <p>Radiation and Chemical Degradation Methods. Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers.</p> |

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| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired From this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. Gowariker V.R, N.V.Viswanthan and JayadevSreedhar. Polymer Science. New Delhi: New Age International, 2015 2. Misra G.S. Introductory Polymer Chemistry .NewDelhi: Wiley Eastern, 2010. 3. Bahadur PandSastry NV. Principles of Polymer Science .New Delhi: Narosa Publishing House, 2005 4. Ahluwalia, V.K.Anuradha Mishra, <i>Polymer Science A Text Book</i>, Ane Books India: New Delhi, 2008. 5. Morrison,R.R.; Boyd,R.N.; Bhattacharjee, S.K. <i>Organic Chemistry</i>, 7thed.; Pearson: NewDelhi, 2011. |
| Reference Books | <ol style="list-style-type: none"> 1. Billmeyer,F.W. PolymerScience.India: Wiley-Interscience,2007. 2. Seymour, R. B.; Carraher Jr.C.E. <i>Polymer Chemistry: An Introduction</i>, Marcel Dckker Inc: NewYork,1981. 3. Sinha,R. <i>Outlines of Polymer Technology</i>, Prentice Hall of India: New Delhi, 2000. 4. JoelR.Fried, <i>Polymer Science and Technology</i>,3rded.; Prentice Hall of India: New Delhi, 2014. |
| Website and e-learning source | <ol style="list-style-type: none"> 1. https://polymerdatabase.com 2. http://amrita.vlab.co.in/?sub=2&brch=190&sim=603&cnt=13.http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers.htmhttp://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weights+of+polymers.pdf |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to</p> <p>CO1: explain classification of polymers, elastomers, fibres and liquid resins</p> <p>CO2: explain addition and condensation polymerization, mechanical properties of polymers</p> <p>CO3: determine the molecular weight of polymers, and explain the thermal properties of</p> | |

polymers

CO4: explain reactions of polymers and polymer processing

CO5: discuss speciality polymers like PVC, PMMA, rubbers, biodegradable polymers

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

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

Level of Correlation between PSO's and CO's

| Title of the Course | AGRO CHEMISTRY | | | | | |
|------------------------------|--|----------|--------------|----------|-------|-------------|
| Paper No. | EC-VIII B | | | | | |
| Category | Elective | Year | III | Credit s | 3 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 4 | | - | | 5 | |
| Prerequisites | Knowledge on fertilizers, pesticides and testing of soil | | | | | |
| Objectives of the course | The course aims at providing an overall view of <ul style="list-style-type: none"> To learn about fertilizers and pesticides To study the origin, characterization and testing of soil | | | | | |

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| <p>Course outline</p> | <p>UNIT – 1 Fertilizers Classification, macronutrients -role of nitrogen, potassium and phosphorus on plant growth - manufacture of urea, muriate potash and triple superphosphate. Complex fertilizers, mixed fertilizers & biofertilizers - their composition. Micronutrients - their role in plants. Manures: Bulky organic manures - Farm yard manure - oil cakes - blood meal - fish manures - Composting process - handling and storage</p> <p>UNIT- II Pesticides Definition - Classification of Pesticides based on the use and chemical composition - examples - general methods of application - Benefits of pesticides - Potential hazards. Safety measures -first aid Insecticides: Plant products - Nicotine, pyrethin- Inorganic pesticides - borates. Organic pesticides - D.D.T. and BHC. Fungicide: Sulphur compounds, Copper compounds, Bordeaux mixture. Herbicides: Acaricides - Rodenticides. Attractants - Repellants.</p> <p>UNIT -III Soil Origin of soil - definition of soil - rock system - weathering of rocks and minerals-main components of soil - organic, inorganic constituents - soil formation - factors favouring soil formation.</p> <p>UNIT –IV Characteristics of soil Physical aspects - soil texture - pore space - bulk density, particle density - soil colour- surface area - soil colloids - plasticity, shrinkage - flocculation and deflocculation, soil air, soil temperature and their importance in plant growth. Acid, alkaline and saline soils - diagnosis - Methods of reclamation and after care.</p> <p>UNIT –V Soil testing Concept and objectives - soil sampling, tools, collection, processing, and dispatch of soil sample. Estimation of total organic compound, available nitrogen and phosphorus in the soil sample. Determination of pH, EC, moisture content, bulk density and particle density of the soil sample.</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper)</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| <p>Skills acquired From this course</p> | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |

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|--------------------------------------|---|
| Recommended Text | 1. A text book of Soil Science - Daji.A, Asia Publishing House, Madras 1970. 2. Textbook of soil Chemical Analysis - Hesse,P.R.A John Murray Newyork,1971 |
| Reference Books | 1. Textbook of Soil Science - Biswas, T.D and Mukherjee,S.K. Second edition, Tata McGraw-Hill Education 2. Chemistry for Agriculture and Ecology-Y.MidoM.Satake, Discovery Publishing 3. Soil Fertility & Fertilisers - Samuel L. Tisdale, Werner L. Nelson, James D. Beaton, John L. Havlin. Fifth edition, Macmillan 4. Nature and properties of soils-Harry, O Buckman N Yle C. Brandy, Macmillan 5. Insecticides, Pesticides and Agro based Industries - R.C.Paliwal, K.Goel, R.K. Gupta, Small Business Publications |
| Website and e-learning source | 1. http://www.mcgill.ca - 2. http://naas.org.in |

Course Learning Outcomes (for Mapping with POs and PSOs) On

completion of the course the students should be able to

CO1: explain classification of fertilizers

CO2: explain the classification of pesticides and insecticides.

CO3: determine the factors favouring soil formation

CO4: explain the characteristic of soil

CO5: explain the methods of testing of soil

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

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |

| | | | | | |
|--|-----|-----|-----|-----|-----|
| Weighted percentage of Course Contribution to PSOs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
|--|-----|-----|-----|-----|-----|

Level of Correlation between PSO's and CO's

| | | | | | | |
|-------------------------------------|---|-----------------|---------------------|-----------------|--------------|--------------------|
| Title of the Course | *TEXTILE CHEMISTRY | | | | | |
| Paper No. | Naan Mudhalvan (substitute) | | | | | |
| Category | SEC | Year | III | Credit s | 2 | Course Code |
| | | Semester | VI | | | |
| Instructional Hours per week | Lecture | Tutorial | Lab Practice | | Total | |
| | 2 | | - | | 2 | |
| Prerequisites | Knowledge on fibers and dyes | | | | | |
| Objectives of the course | <p>The primary objective of the courses is to</p> <ul style="list-style-type: none"> • Learn types of fibres and removal of impurities in fibres • Know briefly about natural and manmade fibres • Study on Dyeing and printing fibres | | | | | |
| Course outline | <p>UNIT- I TEXTILE FIBERS Introduction to textiles and essential requirements of textile fibres - Classification of textile fibres - Natural and Man-made fibres - Characteristics of textile fibres. Advantages and Disadvantages of natural and man-made fibres. Impurities in fibres - General principle of removal of impurities in fibres - singeing - Scouring - Bleaching – De sizing – Kier boiling - Chemicking - Degumming. Flow charts showing the process involved in textile industry.</p> <p>UNIT- II NATURAL FIBRES Natural fibres - Types of natural fibres - Natural Cellulosic fibres: Cotton and Jute - Natural protein fibres: Wool and Silk. Cellulosic fibres: Cotton fibres Geographical distribution, Structure, Physical and Chemical properties, Grading of cotton fibres - Uses of cotton. Protein fibres: Silk fibre -Study of life cycle of silkworm - Extraction of silk fibre - Properties of silk fibre - Special features of silk fibre - Uses of silk- Wool- origin, different types of wool properties wool - Process involved in the removal of impurities from raw wool- Uses of wool. Bast and leaf fibres - Types of bastfibres: Sisal and Ramie - Geographical distribution - Extraction - Properties of major bast fibres - Uses- Introduction to Coir, Hemp and Banana fibres.</p> <p>UNIT- III MAN-MADE FIBRES Man-made fibres: General principle of manufacturing of Man-made fibres - Types of Man-made fibres comparison of Man-made fibres with natural fibres. Regenerated fibres – Cellulose fibres (Rayon and Acetate fibres) - Protein fibres (Azlons) – Production - Properties and Uses Synthetic fibres - Poly amide fibres (nylons) - Polyester fibres –Polynsolic fibres, Polyacrylic fibres – Poly Urethane - Polypropylene- polyolefins - Important Physical and Chemical properties and applications.</p> | | | | | |

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| | <p>UNIT- IV DYES AND DYEING OF FIBRES Introduction of dyes - Classification, Properties and Uses of dyes - Dyeing of textile materials(Cotton, Wool and Silk) by direct, acid, basic, vat, disperse and reactive dyes - Fastness of properties of Dyed materials. Finishes given to fabrics - Methods used to process of mercerizing anti crease and Anti shrink finishes water proofing.</p> <p>UNIT- V TEXTILE PRINTING Textile printing - Difference between dyeing and printing - Different steps involved in printing :Preparation of materials, Preparation of printing paste, Different thickeners, drying of printing - Washing and drying of printed material - Printing procedure of fibres, Printing with direct and azoic colours.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination Question paper) | |
| Skills acquired From this course | |
| Recommended Text | <ol style="list-style-type: none"> 1. Chemical Technology of Fibrous Materials, F.Sadov, M.Kovchagin and A. Mateshy Mir Publishers, Moscow, 1978. 2. Dyeing and Chemical technology of textile fibres - 5** edition, E.R.TrotmanCharles - Griffin and Co Ltd, 1975 3. A Textbook of Fibre and Science and Technology, S.P.Mishra, New Age International (P) Lid- 2000. 4. James Ronald, Printing and Dying of Fabrics and Plastics, Maharajan Book Distributors, 1996 |
| Reference Books | <ol style="list-style-type: none"> 1. Chemistry of Dyes and Principles of Dyeing, 2" Edition V.A. Shenai, Sevak Publications, Mumbai, 1983. 2. Berns, R.Bill Meyer and Saltzmanns, Principles of Colour Technology, 3"* edition, New York, NY; John Wiley and Sons, Inc;2000. 3. V.A. Shenai, Introduction to the Chemistry of Dye Stuffs, Sevak, Mumbai 1991. 4. Textile Chemistry - Vol I and II, R.H. Peters Elsevier, Amsterdam, London, 1963. 5. Introductory to Textile Science - 3' edition, Maryory LJoshep,3"" Edition, Holt, Rinchart and Winson,3 Publishers, 1977. |
| Website and e-learning source | <ol style="list-style-type: none"> 1. https://bteup.ac.in 2. https://www.esociety-conf.org |

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

CO1: explain classification of textile fibers

CO2: explain the characteristics of natural fibers

CO3: illustrate the properties and uses of man-made fiber

CO4: elaborate the dyeing process of fiber

CO5: distinguish between dyeing and printing process of fiber.

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

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

Level of Correlation between PSO's and CO's

GENERIC ELECTIVE

| | | | | | | | |
|------------------------------|---|----------|-------|--------------|-------|-------------|--|
| Title of the course | CHEMISTRY FOR PHYSICAL SCIENCES I (FOR MATHEMATICS AND PHYSICS STUDENTS) | | | | | | |
| Paper No. | Generic elective 1 | | | | | | |
| Category | Generic elective | Year | I/II | Credits | 3 | Course code | |
| | | Semester | I/III | | | | |
| Instructional hours per week | Lecture | Tutorial | | Lab Practice | Total | | |
| | 4 | - | | - | 4 | | |
| Prerequisites | Higher secondary chemistry | | | | | | |

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| Objectives of the course | <p>This course aims to provide knowledge on the basics of atomic orbitals, chemical bonds, hybridization</p> <p>Course Outline</p> <ul style="list-style-type: none"> • concepts of thermodynamics and its applications. • concepts of nuclear chemistry • importance of chemical industries • Qualitative and analytical methods. |
| Course Outline | <p>UNIT- I Chemical Bonding and Nuclear Chemistry: Molecular Orbital Theory- bonding, anti bonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect calculations. Nuclear fission and nuclear fusion differences - Stellar energy. Applications of radioisotopes - carbon dating, rock dating and applications.</p> |
| | <p>Unit- II Industrial Chemistry Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.</p> <p>UNIT- III Fundamental Concepts in Organic Chemistry Hybridization: Orbital overlap, hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Electronic effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples. Reaction mechanisms: Types of reactions-aromaticity (Huckel's rule) aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p> <p>UNIT- IV Thermodynamics and Phase Equilibria Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of entropy and Gibbs free energy Relationship between Gibbs free energy and entropy.</p> <p>Phase Equilibria: Phase rule definition of terms in it. Applications of phase rule to water system. Two component system Reduced phase rule and its application to a simple eutectic system (Pb-Ag).</p> <p>UNIT- V</p> |

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| | <p>Analytical Chemistry Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper) Skills acquired from this course Recommended Text | Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours) |
| skills acquired from this course | Knowledge, Problem solving. Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended text | <ol style="list-style-type: none"> 1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009. 2. S. Vaithyanathan, Text book of Ancillary Chemistry, Priya Publications, Karur, 2006. 3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. |
| Reference Books | <ol style="list-style-type: none"> 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry: Vishal Publishing Co., New Delhi, forty seventh edition, 2018. 3. B.K,Sharma, Industrial Chemistry; GOEL publishinghouse, Meerut,sixteenthedition, 2014. |
| <p>Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO 1: gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications. CO 2: evaluate the efficiencies and uses of various fuels and fertilizers organic reactions. CO 3: explain the type of hybridization, electronic effect and reaction mechanism. CO 4: apply various thermodynamic principles, systems and phase rule. CO 5: explain various methods to identify an appropriate method for the separation of chemical components</p> | |

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

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|---------------------------------|--|----------|-------|--------------|-------|-------------|--|
| Title of the course | CHEMISTRY FOR PHYSICAL SCIENCES II (FOR MATHEMATICS AND PHYSICS STUDENTS) | | | | | | |
| Paper No. | General elective II | | | | | | |
| Category | General elective | Year | I/II | Credits | 3 | Course code | |
| | | Semester | II/IV | | | | |
| Instructional hours per week | Lecture | Tutorial | | Lab Practice | Total | | |
| | 4 | - | | - | 4 | | |
| Prerequisites | Chemistry for physical chemistry - I | | | | | | |
| Objectives of the course | This course aims at providing knowledge on the Co-ordination Chemistry and Water Technology Carbohydrates and Amino acids basics and applications of electrochemistry basics and applications of kinetics and catalysis | | | | | | |
| Course Outline | UNIT- I Co-ordination Chemistry and Water Technology Course Outline Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature Werner's theory EAN rule Pauling's theory Postulates Applications to $[\text{Ni}(\text{CO})_4]$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Co}(\text{CN})_6]^{3-}$ Chelation Biological role of Haemoglobin and Chlorophyll (elementary idea) Applications in qualitative and quantitative analysis. Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD. | | | | | | |
| | Unit- II Carbohydrates and Amino acids Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose inter conversion. Properties of starch and cellulose. Amino acids: Classification preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only). | | | | | | |

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| | <p>UNIT- III Electrochemistry Galvanic cells Standard hydrogen electrode calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes ionic product of water pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method - buffer solutions and its biological applications electroplating Nickel and chrome plating-Types of cells-fuel cells-corrosion and its prevention.</p> <p>.</p> |
| | <p>UNIT- IV Kinetics and Catalysis Order and molecularity. Integrated rate expression for I and II (2A Products) order reactions, Pseudo first order reaction, methods of determining order of a reaction Half-life period - Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.</p> |
| | <p>UNIT- V Photochemistry Grothus Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence photosensitization and photosynthesis (definition with examples)</p> |
| <p>Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper) Skills acquired from this course Recommended Text</p> | <p>Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)</p> |
| skills acquired from this course | <p>Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.</p> |
| Recommended text | <ol style="list-style-type: none"> 1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009. 2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry: S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. |
| Reference book | <ol style="list-style-type: none"> 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry: Vishal Publishing Co., New Delhi, forty seventh edition, 2018. 3. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, |

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| | sixteenth edition, 2014 |
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Course Learning Outcomes (for Mapping with PO's and PSs)

On completion of the course the students should be able to

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

CO 2: explain the preparation and property of carbohydrate.

CO 3: enlighten the biological role of transition metals, amino acids and nucleic acids.

CO 4: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.

CO 5: outline the various type of photochemical process.

Level of correlation between PSO's and CO's

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

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|-------------------------------------|---|----------|-------|--------------|-------|-------------|--|
| Title of the course | CHEMISTRY FOR BIOLOGICAL SCIENCES I (FOR BOTANY AND ZOOLOGY) | | | | | | |
| Paper No. | General elective – I/III | | | | | | |
| Category | General elective | Year | 1/II | Credits | 3 | Course code | |
| | | Semester | 1/III | | | | |
| Instructional hours per week | Lecture | Tutorial | | Lab Practice | Total | | |
| | 4 | - | | - | 4 | | |
| Prerequisites | Higher secondary chemistry | | | | | | |

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| Objectives of the course | <p>This course aims at providing knowledge on</p> <ul style="list-style-type: none"> • basics of atomic orbitals, chemical bonds, • hybridization and fundamentals of organic chemistry • nuclear chemistry and industrial chemistry • importance of speciality drugs and • separation and purification techniques |
| Course Outline | <p>UNIT- I</p> <p>Chemical Bonding and Nuclear Chemistry</p> <p>Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.</p> <p>Nuclear Chemistry: Fundamental particles Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions - group displacement law. Nuclear binding energy - mass defect calculations. Nuclear fission and nuclear fusion differences Stellar energy. Applications of radioisotopes - carbon dating, rock dating and medicinal applications.</p> <p>Unit-II</p> <p>Industrial Chemistry</p> <p>Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).</p> <p>Silicones: Synthesis, properties and uses of silicones.</p> <p>Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.</p> <p>UNIT- III</p> <p>Fundamental Concepts in Organic Chemistry</p> <p>Hybridization: Orbital overlap hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Polar effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.</p> <p>Reaction mechanisms: Types of reactions-aromaticity (Huckel's rule) aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.</p> |

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| | <p>UNIT- IV</p> <p>Drugs and Speciality Chemicals</p> <p>Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether: Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.</p> |
| | UNIT –V |

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| | <p>Analytical Chemistry Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper) Skills acquired from this course | Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours) |
| | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | <ol style="list-style-type: none"> 1. V. Veeraiyan, Text book of Ancillary Chemistry, High mount publishing house, Chennai, first edition, 2009. 2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. |

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| Reference Book | <ol style="list-style-type: none"> 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 2. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry: Vishal Publishing Co., New Delhi, forty seventh edition, 2018. 3. B.K. Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. |
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Course Learning Outcomes (for Mapping with POs and PSOs) .
On completion of the course the students should be able to
CO1: state the theories of chemical bonding, nuclear reactions and its applications.
CO 2: evaluate the efficiencies and uses of various fuels and fertilizers.
CO 3: explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
CO 4: demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.
CO 5: analyse various methods to identify an appropriate method for the separation of chemical components.

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

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

Level of Correlation between PSO's and CO's

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|---------------------------------|--|----------|-------|--------------|-------|-------------|--|
| Title of the course | CHEMISTRY FOR BIOLOGICAL SCIENCES II (FOR BOTANY AND ZOOLOGY) | | | | | | |
| Paper No. | General elective – II/IV | | | | | | |
| Category | General elective | Year | I/II | Credits | 3 | Course code | |
| | | Semester | II/IV | | | | |
| Instructional hours per week | Lecture | Tutorial | | Lab Practice | Total | | |
| | 4 | - | | - | 4 | | |
| Prerequisites | Chemistry for biological sciences –I | | | | | | |
| Objectives of the course | <p>This course aims to provide knowledge on</p> <ul style="list-style-type: none"> • Nomenclature of coordination compounds and carbohydrates. • Amino acids and Essential elements of biosystem • understand the concepts of kinetics and catalysis • provide fundamentals of electrochemistry and photochemistry | | | | | | |
| Course Outline | <p>UNIT- I</p> <p>Co-ordination Chemistry: Definition of terms IUPAC Nomenclature Werner's theory EAN rule Pauling's theory-Postulates- Applications to $[\text{Ni}(\text{CO})_4]$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Co}(\text{CN})_6]^{3-}$, Chelation Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.</p> <p>Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques -BOD and COD.</p> | | | | | | |

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| | <p>Unit- II Carbohydrates Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.</p> |
| | <p>Unit- III Amino acids and Essential elements of biosystem Amino acids: Classification preparation and properties of alanine, preparation of dipeptides using Bergmann method. Proteins- classification – structure – colour reactions- Biological functions –nucleosides – nucleotides - RNA and DNA . -structure. Essentials of trace metals in biological system –Na, Cu, K, Zn, Fe and Mg</p> |
| | <p>UNIT- IV Electrochemistry Galvanic cells - Standard hydrogen electrode calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method - buffer solutions and its biological applications electroplating - Nickel and chrome plating-Types of cells-fuel cells-corrosion and its prevention.</p> |
| | <p>UNIT –V Photochemistry GrothusDrapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence photosensitization and photosynthesis - definition with examples.</p> |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper) Skills acquired from this course Recommended Text | Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours) |
| | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| | <ol style="list-style-type: none"> 1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009. 2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry: S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. |
| Reference Books | 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry: |
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| | <p>Sultan Chand and Company, New Delhi, twentieth edition, 2007.</p> <p>2. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry, Vishal Publishing Co., New Delhi, forty seventh edition, 2018.</p> <p>3. B.K.Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.</p> |
| <p>Course Learning Outcomes (for Mapping with PO's and PSO's)</p> <p>On completion of the course the students should be able to</p> <p>CO 1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.</p> <p>CO 2: explain the preparation and property of carbohydrate.</p> <p>CO 3: enlighten the biological role of transition metals, amino acids and nucleic acids.</p> <p>CO 4: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.</p> <p>CO 5: outline the various type of photochemical process.</p> | |

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

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

Level of Correlation between PSO's and CO's

| | | | | | | | |
|----------------------------|---|----------|-------|--------------|-------|-------------|--|
| Title of the course | CHEMISTRY FOR PHYSICAL AND BIOLOGICAL SCIENCES | | | | | | |
| | Inorganic volumetric Analysis | | | | | | |
| Paper No. | General elective IP/IIP | | | | | | |
| Category | General elective | Year | I/II | Credits | 2 | Course code | |
| | | Semester | I/III | | | | |
| Instructional hours | Lecture | Tutorial | | Lab Practice | Total | | |

| | | | | |
|---------------------------------|---|---|---|---|
| per week | | - | 2 | 2 |
| Prerequisites | | | | |
| Objectives of the course | <p>This course aims to provide knowledge on</p> <p>*basics of preparation of solutions</p> <p>principles and practical experience of volumetric analysis</p> | | | |
| Course Outline | <p>VOLUMETRIC ANALYSIS</p> <ol style="list-style-type: none"> 1. Estimation of sodium hydroxide using standard sodium carbonate. 2. Estimation of hydrochloric acid using standard oxalic acid. 3. Estimation of ferrous sulphate using standard mohrs salt. 4. Estimation of oxalic acid using standard ferrous sulphate. 5. Estimation of potassium permanganate using standard sodiumhydroxide. 6. Estimation of magnesium using EDTA, 7. Estimation of ferrous ion using diphenyl amine as indicator, | | | |
| Reference Book | <p>V.Venkateswaran, R.Veeratomy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.</p> | | | |
| | <p>Course Learning Outcomes (for Mapping with POs and PSOs)</p> <p>On completion of the course the students should be able to</p> <p>CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.</p> <p>CO 2: design, carry out, record and interpret the results of volumetric titration.</p> <p>CO 3: apply their skill in the analysis of water/hardness.</p> <p>CO4: analyze the chemical constituents in allied chemical products</p> | | | |

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|-------|-----|-----|-----|-----|-----|
| CO1 | S | S | M | M | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | M | M | S |
| CO3 | M | S | S | S | M |
| CO4 | S | S | M | S | S |

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of course contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of correlation between PSO's and CO's

| | |
|----------------------------|--|
| Title of the course | CHEMISTRY FOR PHYSICAL AND BIOLOGICAL SCIENCES ORGANIC ANALYSIS |
| Paper No. | General elective IIP/IVP |

| | | | | | | | |
|---------------------------------|---|----------|-------|--------------|-------|-------------|--|
| Category | General elective | Year | I/II | Credits | 2 | Course code | |
| | | Semester | I/III | | | | |
| Instructional hours per week | Lecture | Tutorial | | Lab Practice | Total | | |
| | | - | | 2 | 2 | | |
| Prerequisites | Chemistry for biological sciences | | | | | | |
| Objectives of the course | <p>This course aims to provide knowledge on</p> <ul style="list-style-type: none"> * identification of organic functional group *different types of organic compounds with respect to their properties *determination of elements in organic compound | | | | | | |
| Course Outline | <p>SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS</p> <p>The analysis must be carried out as follows</p> <p>(a) functional group tests (phenol, acids (mono and di) aromatic primary amine, amides(mono and di), aldehyde, and glucose.</p> <p>(b) detection of elements(N,S halogens).</p> <p>(c) to distinguish between aliphatic and aromatic compounds.</p> <p>(d) to distinguish saturated and unsaturated compounds.</p> | | | | | | |
| Reference Books | V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997. | | | | | | |
| | <p>Course Learning Outcomes (for Mapping with PO's and PSO's)</p> <p>On completion of the course the students should be able to</p> <p>CO1: gain an understanding of the use of various organic functional groups.</p> <p>CO 2: design, carry out, record and interpret the results of organic analysis.</p> <p>CO 3: apply their skill in the identification of organic compounds in the plant extracts.</p> <p>CO4: analyze the chemical constituents in allied chemical products</p> | | | | | | |

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|-------|-----|-----|-----|-----|-----|
| CO1 | S | S | S | M | S |
| CO2 | M | S | S | S | S |
| CO3 | S | S | M | S | S |
| CO3 | M | S | S | M | M |
| CO4 | S | S | M | M | S |

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of course contribution to PO's | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of correlation between PSO's and CO's

**DEPARTMENT OF CHEMISTRY
PROGRAMME SPECIFIC OUTCOMES**

On successful completion of the programme the students will be able to

PSO1: acquire in-depth knowledge of the fundamental concepts in all disciplines of chemistry.

PSO2: disseminate the basics of chemistry and advanced topics and analytical skills in organic, inorganic and physical chemistry.

PSO3: uphold ethical values in personal life, research and career.

PSO4: demonstrate laboratory skills, analytical acumen, creatively in academics and research.

PSO5: apply digital tools to collect, analyze and interpret data and present scientific findings.

PSO6: gain competence to pursue higher education and career opportunities in chemistry and allied fields.

PSO7: exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities.

PSO8: apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits.

PSO9: exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.

PSO10: display proactive approach towards sustainable environment through green laboratory practices.

| PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| PO1 | X | | | | | | | | | |
| PO2 | | X | | | | | | | | |
| PO3 | | | X | | | | | | | |
| PO4 | | | | X | | | | | | |
| PO5 | | | | | X | | | | | |
| PO6 | | | | | | X | | | | |
| PO7 | | | | | | | X | | | |
| PO8 | | | | | | | | X | | |
| PO9 | | | | | | | | | X | |
| PO10 | | | | | | | | | | X |