

Academic year 2021 -2022
Department of Chemistry
1.1.1 PO's, PSO's and CO's
Programme Outcome

On completion of the programme, students will be able

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| PO1: To understand major concepts, theoretical principles, experimental findings and the ability to employ them for critical thinking and efficient problem-solving skills in different areas of chemistry. |
| PO2: To work with modern instrumentation & classical techniques, conduct experiments, analyze data and interpret results effectively in diverse teams and to follow safe and hygienic laboratory practices. |
| PO3: To gain entry into higher studies, research and job market with the knowledge of chemistry and other associated multidisciplinary subjects including physics and mathematics. |
| PO4: To expose and develop technical, analytical and creative skills. |
| PO5: To promote and uphold Self-Discipline, Leadership Qualities, Secular Outlook, National Integration and Civic Responsibility |
| PO6: Augment the Acquisition of Micro and Macro Skills of Tamil, Malayalam, Hindi and French Language Usages |
| PO7: Enhance Communicative Linguistic Competency and Employability Quotient |
| PO8: Exhibit consistent academic excellence and integrated personality towards lifelong Learning. |

Programme Specific Outcomes (PSOs)

At the end of the program, the students will be

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| PSO 1: Proficient in chemical synthesis and analysis. |
| PSO 2: Competent in basic IT and entrepreneurial skills pertained to chemists. |
| PSO 3: Able to review the literature, design experiments and develop solutions to chemistry problems. |

Course outcomes: Semester 1, Part III Core I General Chemistry I, Course code 121C01

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Demonstrate safe laboratory practices and principles of qualitative inorganic analysis | A |

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| CO2 | Employ various statistical tools to solve simple chemical problems and the potential use of green chemistry in organic synthesis | An |
| CO3 | Express the fundamental assumptions of atomic theories and discuss the arrangement of elements in the periodic table and their periodic properties | A |
| CO4 | Demonstrate ionic bond, covalent bond co-ordinate bonding, metallic bonding, Hydrogen bonding and VBT | A |
| CO5 | Analyse molecular geometries based on MOT, hybridization concept and VSEPR theory | An |

Semester 2, Part III Core II General Chemistry II , Course code 221C02

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Explain the importance of reaction intermediates | U |
| CO2 | Write the mechanism for substitution and elimination reactions | A |
| CO3 | Discuss the chemistry of alkanes and cycloalkanes | U |
| CO4 | Describe the chemistry of s block and zero block elements | U |
| CO5 | Explain the various processes involved in metallurgy | U |

Semester 2, Part III Core III States of Matter, Course Code: 221C03

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Explain the principle and physical attributes of the solid state and solve simple numerical problems based on it | A |
| CO2 | Discuss the concepts of Liquid State and Liquid Crystals. | U |
| CO3 | Use the various gas laws to determine the stoichiometry of reactions and kinetic-molecular theory at the molecular level. | A |
| CO4 | Explain the features of solutions of liquid in liquid and gases in liquids with various laws. | U |
| CO5 | Describe the colligative properties and their uses in determining the characteristic of solutions. | U |

Semester: 2 Part III Core Practical I Inorganic Qualitative Analysis, Course Code: 221CP1

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Understand the safety and hygiene practices while working in laboratory. | U |

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| CO2 | Identify cations and anions present in a given substance using micro scale qualitative analysis methods. | An |
| CO3 | Analyze common ion effect between CuCl_2 and NaCl , Liquid NH_3 and NH_4Cl , Separate immiscible liquids, decolorize brown sugar, Prepare benzopinacol. | An |

Semester: I, Part III Allied I Chemistry Course Code: 121AP1/121AM2

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Describe the basic ideas related to organic reactions, types of organic reactions and organic solvents. | U |
| CO2 | Explain the preparation and properties of aromatic hydrocarbons. | U |
| CO3 | Use hybridization and VSEPR theory to discuss geometry of molecules and the types of chemical bonds. | A |
| CO4 | Discuss the various types of separation techniques. | U |
| CO5 | Solve simple problems involved in concentration terms and discuss the concepts of acids and bases. | A |

Semester: I Part III Allied I Chemistry I , Course Code: 121AZ1

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Explain the fundamental concepts of chemical bonding and co-ordination chemistry. | U |
| CO2 | Describe the reaction intermediates, types of polar effects, types of chemical reactions and electrophilic mono substitution reaction of benzene. | U |
| CO3 | Use the fundamentals of electrochemistry and importance of pH and buffer solution in biological systems in related areas | A |
| CO4 | Explain the different types of separation techniques and the applications of chromatography | U |
| CO5 | Discuss the basic concepts of dye chemistry and industrial applications of Silicones and fertilizers. | U |

Semester – II Part III Allied II Chemistry II Course Code: 221AP2/221AM4

| CO | Statement | Bloom's Taxonomy level |
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| CO1 | Explain the basic concepts of phase rule and chemical equilibrium | U |
| CO2 | Discuss the principles of surface chemistry and electrochemistry. | U |
| CO3 | Use the rate equations to solve simple problems related to chemical kinetics and explain the laws and applications of photochemistry | A |
| CO4 | Explain the principles and process of metallurgy. | U |
| CO5 | Discuss the basic concepts in nuclear chemistry and polymer Chemistry | U |

Semester: II Part III Allied II Chemistry II, Course Code: 221AZ2

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Explain the structure, composition and biological functions of carbohydrates and biological importance of vitamins | U |
| CO2 | Describe the basics of amino acids, proteins and nucleic acids | U |
| CO3 | Illustrate the concepts of renewable and non-renewable energy resources and its applications. | A |
| CO4 | Explain the theoretical basis of heterocyclic compounds and solve the simple problems involved in photochemistry. | U |
| CO5 | Discuss the fundamentals of antipyretics, analgesics, antibiotics and antimalarial drugs. | U |

Semesters: I and II Part III Allied Chemistry Practical Course Code: 221APP/221AZP/221AMP

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Perform accurate quantitative measurements, calculations and to estimate the amount of given inorganic species using volumetric principles. | A |
| CO2 | Determine the functional group of an unknown organic compound. | A |
| CO3 | Determine the conductance of electrolytes and prepare buffer solutions of different pH | A |

Semester: III, Part III Core III General Chemistry III, Course Code: 320C03

| CO | Statement | Bloom's Taxonomy level |
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| CO1 | Describe various properties of elements and compounds of zero group, alkali and alkaline earth metals and account for different processes involved in metallurgy | U |
| CO2 | Explain the principles and applications behind green chemistry and nano science | U |
| CO3 | Employ the properties of alcohols, phenols, ethers and epoxides to perform organic conversions and solve organic problems. | A |
| CO4 | Discuss the basic principles of chemical kinetics and catalysis | U |
| CO5 | Explain the fundamental concepts of photochemistry | U |

Semester: III, Part IV Non Major Elective Course: Food Preservation and Adulteration, Course Code: 320NCE

| CO | Statement | Bloom's Taxonomy level |
|-----|--|------------------------|
| CO1 | Explain the constituents of food and food safety. | U |
| CO2 | Summarize the basics of spoilages. | U |
| CO3 | Relate the role of chemistry in adulteration and its analysis. | An |
| CO4 | Describe the process of food preservation and processing. | U |
| CO5 | Discuss about processed food products | U |

Semester: III, Part IV Skill Enhancement Course I Professional English for Chemists, Course Code: 320CS1

| CO | Statement | Bloom's Taxonomy level |
|-----|--|------------------------|
| CO1 | Use their ability to improve their competence in using the language | A |
| CO2 | Speak with confidence in an intelligible and acceptable manner | A |
| CO3 | Sense the importance of reading for life | A |
| CO4 | Read independently unfamiliar texts with comprehension | A |
| CO5 | Write simple sentences without committing error of spelling or grammar | A |

Semester: IV, Part III Core IV- General Chemistry IV Course Code: 420C04

| CO | Statement | Bloom's Taxonomy level |
|-----|---|------------------------|
| CO1 | Describe the principle, physical attributes of the solid state | U |
| CO2 | Explain the basic concept in Quantum mechanics, Liquid State and Liquid Crystals. | U |

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| CO3 | Demonstrate solutions of non-electrolytes, colligative properties and their uses in determining the characteristic of solutions. Apply the principles of colligative properties and Nernst Distribution law. | A |
| CO4 | Discuss the chemistry of Nitrogen containing compounds . | U |
| CO5 | Explain the reactivity of heterocyclic compounds and active methylene groups. | U |

Semester: IV, Part III Core Practical II Volumetric and Organic Analysis, Course Code: 420CP2

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Prepare standard solutions, perform accurate quantitative measurements, calculations, draw accurate conclusions and to estimate the amount of given inorganic species using volumetric principles | A |
| CO2 | Predict the outcome of qualitative organic reactions and prepare suitable derivatives | A |
| CO3 | Estimate organic compounds | A |

Semester: IV, Part IV Skill Enhancement Course II- IT Skill for Chemistry, Course Code: 420CS2

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Draw accurate chemical structures, schemes, reactions and their mechanisms using Chemdraw soft ware | A |
| CO2 | Draw simple and advanced 2D and 3D plot charts, the absorption, emission and IR spectrum using Origin software from the given data | A |
| CO3 | Build macromolecules, materials structure and geometry using Avogadro software | A |
| CO4 | Explain the fundamentals of cheminformatics and its applications | U |

Semester: IV, Advanced Learner's Course I: Food Science, Course Code: 420CA1

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Explain the food groups & major nutrients and constituents of food | U |
| CO2 | Describe the fundamental information about food additives. | U |
| CO3 | Discuss the food adulterants and standards the theory of food adulteration and food safety & standards | U |
| CO4 | Know the principles involved in food preservation and the importance of food preservation and processing. | U |
| CO5 | Demonstrate the use of testing food quality and explicit its importance | A |

Semester 5, Part III Core V Organic Chemistry I Course Code: 517C05

| CO | Statement | Bloom's Taxonomy level |
|-----|--|------------------------|
| CO1 | Interpret the fundamental aspects of stereochemistry, optical activity in organic compounds, racemisation, resolution and geometrical isomerism | A |
| CO2 | Predict a logical and detailed mechanisms for rearrangement reactions | A |
| CO3 | Draw Fisher, Sawhorse and Newmann projection formulas, perform energy calculations, illustrate the preparation and properties of cyclo paraffins | A |
| CO4 | Analyse the preparation, properties of carbonyl compounds and execute organic conversions. | A |
| CO5 | Investigate the chemistry of carboxylic acids and their derivatives. | A |

Semester 5, Part III Core VI Inorganic Chemistry I Course Code: 517C06

| CO | Statement | Bloom's Taxonomy level |
|-----|--|------------------------|
| CO1 | Pertain the preparation, properties, structures and uses of some important compounds of p- block elements | A |
| CO2 | Make use of the principles involved in Gravimetric analysis and apply the ethics in the process of precipitation | A |
| CO3 | Employ the principles of radioactivity and nuclear chemistry in various fields | A |

Semester 5, Part III Core VII Physical Chemistry I Course Code: 517C07

| CO | Statement | Bloom's Taxonomy level |
|-----|---|------------------------|
| CO1 | Execute the basic concepts and laws of thermodynamics. | A |
| CO2 | Apply thermo chemistry principles and discuss the concepts of enthalpy and entropy | A |
| CO3 | Develop a competent knowledge in thermodynamic principles and solve the problems in pertaining area of study. | A |
| CO4 | Specify the Le-Chatelier principle and Law of mass action and apply them to any given equilibrium reaction. | A |
| CO5 | Explain the fundamental concepts in colloidal chemistry and surface | A |

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| | chemistry and apply knowledge of adsorption isotherm to interpret Langmuir and B.E.T theory of adsorption. | |
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Semester 5, Part III Elective I Polymer and Dye Chemistry Code: 517CE1

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Account the general structure of polymers, differentiate between natural and man-made polymers, give examples for everyday and industrial application of polymers. | A |
| CO2 | Execute the various polymerization methods, discuss the different polymerization mechanisms and the characterisation methods. | A |
| CO3 | Demonstrate the polymer fractionation methods and Illustrate the methods for the determination of the molecular weight | A |
| CO4 | Analyze the fundamentals involved in the dye chemistry, and to classify the types of dyes on the basis of application | A |
| CO5 | Predict the synthetic methods for some specific dyes and apply the knowledge of dye chemistry in various industry. | A |

Semester 5, Part III Elective I Agro Industrial Chemistry Course Code: 517CE2

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Demonstrate different water softening and treatment methods | U |
| CO2 | Evaluate different types of physico-chemical properties of water and soil | U |
| CO3 | Describe the components, classification of soil, factors controlling soil reactions and soil colloids | U |
| CO4 | Discuss the manufacture, different types of plant nutrients , fertilizers ,pesticides, insecticides and herbicides | U |
| CO5 | Investigate the safe handling of fertilizers, pesticides, insecticides and herbicides | A |
| CO6 | Critique the environmental impact of using fertilizers, pesticides, insecticides and herbicides | A |

Semester 5, Part III Elective II Project Course Code: 517CE3

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Develop experimental skills and to apply these skills to the project task. | A |
| CO2 | Identify procedures to search for and read the latest chemical literature. | U |
| CO3 | Build the skills to communicate effectively and to present ideas clearly and coherently in both the written and oral forms. | A |
| CO4 | Recognize the effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet. | U |

**Semester 5, Part IV Skill Enhancement Course III Chemistry for Exploration II
Course Code: 517CS3**

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Collect, organize, apply, assess, analyze complex experimental data using statistical methods and account for different types of errors and rejection of data | A |
| CO2 | Execute and evaluate calibration curves and linear regressions | A |
| CO3 | Compute statistical inference in the form of confidence intervals, t-test, f-test, one-way analysis of variance and Chi-square test in chemical problems | A |
| CO4 | Develop professional mannered data in an informative graphical representation | A |
| CO5 | Review of literature data from print, web resources and summarize different types of intellectual property rights | A |

Semester 6, Part III Core VIII Organic Chemistry II Course Code: 617C08

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Analyse the structure, preparation, properties and vitality of carbohydrates, vitamins and problems related to deficiency of Vitamins. | A |
| CO2 | Assess the classification of proteins, amino acids and hormones and examine its structure, properties and functions. | A |

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| CO3 | Discover the biological importance of alkaloids, terpenoids and steroids and illustrate the structural interpretation of various alkaloids and terpenoids. | A |
| CO4 | Interpret the terms used in drug chemistry, Investigate the causes and symptoms of various diseases, their preventive measures and mode of action of drugs(antipyretics, analgesics, antibiotics) synthesis and uses of some specific drugs | A |
| CO5 | Report the drugs used as anesthetics, anti-septics, anti-oxidants, sulpha drugs and anti-diabetics. | A |

Semester 6, Part III Core IX Inorganic Chemistry II Course Code: 617C09

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Employ the d and f block elements to compare their characteristics and uses | A |
| CO2 | Discuss and apply the various theories and isomerism of coordination complexes in different fields and interpret the name, structure, magnetic properties of any coordination complexes. | A |
| CO3 | Employ the role of alkali, alkaline and transition metals in biological systems | A |
| CO4 | Enumerate and apply the Electrical properties and various types of magnetic properties of the compounds | A |

Semester 6, Part III Core X Physical Chemistry II Code: 617C10

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Employ the basic knowledge of electrochemistry and related theories/Laws. | A |
| CO2 | Explain the difference between voltaic/galvanic and electrolytic cells, apply the Nernst equation to electrochemical systems and Develop electrodes for measurement of pH and predict the redox potentials. | A |
| CO3 | Discuss salt hydrolysis, corrosion and relate the electrochemical concepts to justify the function of batteries, fuel cells. | A |
| CO4 | Identify and account the most appropriate electroanalytical and thermoanalytical techniques for a specific analysis and Interpret them. | A |
| CO5 | Specify the fundamentals and applications of Group theory and Phase | A |

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Semester 6, Part III Core XI Spectroscopy Course Code: 617C11

| CO | Statement | Bloom's Taxonomy level |
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| CO1 | Recognize the phenomenon of the interaction of light with matter in terms of the relationship with the molecular structure | U |
| CO2 | Describe the principle and instrumentation of rotational, IR, Raman, UV, NMR, ESR and mass spectrometric techniques | U |
| CO3 | Summarize the applications of rotational, IR, UV, NMR and mass spectrometric techniques | U |
| CO4 | Select suitable molecular spectroscopy methods and solve the given scientific problem | A |
| CO5 | Relate the factors affecting positions of absorption signals, solve and interpret basic spectroscopic data to predict and extract the structures at a preliminary level | A |

Semester 6, Part III Elective III Industrial Chemistry Course Code: 617CE4

| CO | Statement | Bloom's Taxonomy level |
|-----|---|------------------------|
| CO1 | Summarize preparation and uses of Explosives, propellants and toxic chemical weapons. | U |
| CO2 | Generalise adhesive and lubricants. | A |
| CO3 | Implement Rubber and Leather technology. | A |
| CO4 | Design Paper Technology. | A |
| CO5 | Develop Textile Technology. | A |

Semester 6, Part III Elective III Applied Chemistry Course Code: 617CE

| CO | Statement | Bloom's Taxonomy level |
|-----|---|------------------------|
| CO1 | Execute the utilization of non renewable energy sources . | A |
| CO2 | Design instruments for renewable energy sources | A |
| CO3 | Demonstrate the manufacture of Glass and cement. | U |
| CO4 | Formulate the principle and usage of oils and fats in different products. | A |
| CO5 | Execute Fermentation process in various industries. | A |

Semester 6, Part III Core Practical III Gravimetric Analysis and Physical Chemistry Experiments Course Code: 617CP3

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Develop some understanding of the professional and safety responsibilities residing in working with chemical systems and to organise the glassware and other apparatus to conduct experiments in Gravimetry and Physical Chemistry. | U |
| CO2 | Review and emphasize skills in stoichiometric calculations | U |
| CO3 | Discuss and execute the steps involved in the gravimetric analysis of a given sample and to Interpret data from the physical chemistry experiments, including the construction of appropriate tables, and graphs | A |

Semester 6, Part III Core Practical IV Applied Chemistry Practical Course Code: 617CP4

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Explain the apparatus handling such as melting point, boiling point and Soxhlet extraction. | U |
| CO2 | Develop basic skills for the determination of physical parameters, estimations, multi-step synthesis of organic compounds and water analysis. | A |
| CO3 | Apply basic techniques used in chemistry laboratory for preparation, purification and identification. | A |

Semester 6, Part IV Skill Enhancement Course IV Nanoscience Course Code: 617CS4

| CO | Statement | Bloom's Taxonomy level |
|------------|--|-------------------------------|
| CO1 | Know the history and future aspects of Nanoscience and nanotechnology. | R |
| CO2 | Classify nanostructured materials. | A |
| CO3 | Apply various methods for synthesis of nanomaterials. | A |
| CO4 | Recognize some common characterization techniques of nanomaterials and apply them in various interdisciplinary fields. | A |

Semester 6, Advanced Learner's Course II: Dairy Chemistry, Course Code: 617ALC

| CO | Statement | Bloom's Taxonomy level |
|------------|---|-------------------------------|
| CO1 | Recognize the composition and factors affecting the composition of milk | R |
| CO2 | Describe the processing of milk | U |
| CO3 | Explain the major milk products and standardization of milk. | A |
| CO4 | Summarize the methods of preparation of various milk products. | U |
| CO5 | Implement the methods for production of fermented milk products | A |