



Shri Swami Vivekanand Shikshan Sanstha

Vivekanand College, Kolhapur

(Autonomous)

Department of Chemistry

Curriculum relevance: Course outcomes with relevance to Local, Regional, and National Global needs (UG) 2018-19 to 2023-24

Sr. No.	Course Code	Course / SECs Titles	Year of Introduction	COs and PSOs with relevance to local/ regional needs	COs & PSOs with relevance to national needs	COs & PSOs with relevance to global needs
B. Sc. Chemistry (Newly Introduced Between 2018-19 and 2020-21)						
1	DSC-1002A	Inorganic and Organic Chemistry	2018-19	<p>CO1: Understand the fundamentals of atom.</p> <p>CO2: Learn the details of 's' and 'p' block elements in the periodic table.</p> <p>CO3: Acquire the knowledge regarding ionic bonding and its formation.</p> <p>CO4: Study the principles of covalent bonding.</p> <p>CO5: Learn the aspects of AOs, MOs, LCAO.</p> <p>CO6: Understand the basic concepts of organic chemistry.</p> <p>CO7: Acquire structural aspects of the organic compounds and its impact on properties.</p> <p>CO8: Describe the various chemical reactions of the aliphatic hydrocarbons like alkanes, alkenes, alkynes.</p>	<p>CO1: Understand the fundamentals of atom.</p> <p>CO2: Learn the details of 's' and 'p' block elements in the periodic table.</p> <p>CO3: Acquire the knowledge regarding ionic bonding and its formation.</p> <p>CO4: Study the principles of covalent bonding.</p> <p>CO5: Learn the aspects of AOs, MOs, LCAO.</p> <p>CO6: Understand the basic concepts of organic chemistry.</p> <p>CO7: Acquire structural aspects of the organic compounds and its impact on properties.</p> <p>CO8: Describe the various chemical reactions of the aliphatic hydrocarbons like alkanes, alkenes, alkynes.</p>	<p>CO1: Understand the fundamentals of atom.</p> <p>CO2: Learn the details of 's' and 'p' block elements in the periodic table.</p> <p>CO3: Acquire the knowledge regarding ionic bonding and its formation.</p> <p>CO4: Study the principles of covalent bonding.</p> <p>CO5: Learn the aspects of AOs, MOs, LCAO.</p> <p>CO6: Understand the basic concepts of organic chemistry.</p> <p>CO7: Acquire structural aspects of the organic compounds and its impact on properties.</p> <p>CO8: Describe the various chemical reactions of the aliphatic hydrocarbons like alkanes, alkenes, alkynes.</p>
2	DSC-1002B	Physical and Chemistry	2018-19	<p>CO1: Learn enthalpy of reaction and its types.</p> <p>CO2: Understand the different laws of thermodynamics and its importance in the chemistry.</p> <p>CO3: Adopt the concept of free energy and its importance in the feasibility of chemical reactions.</p>	<p>CO1: Learn enthalpy of reaction and its types.</p> <p>CO2: Understand the different laws of thermodynamics and its importance in the chemistry.</p> <p>CO3: Adopt the concept of free energy and its importance in the feasibility of chemical reactions.</p>	<p>CO1: Learn enthalpy of reaction and its types.</p> <p>CO2: Understand the different laws of thermodynamics and its importance in the chemistry.</p> <p>CO3: Adopt the concept of free energy and its importance in the feasibility of chemical reactions.</p>

				<p>CO4:Study the fundamental aspects of solubility and ionization.</p> <p>CO5:Describe the various chemical reactions of the aromatic hydrocarbons.</p> <p>CO6:Gain the knowledge of preparation and chemical reactions of various important organic compounds like halides, aldehydes, ether, phenols, alcohols, etc.</p>	<p>CO4:Study the fundamental aspects of solubility and ionization.</p> <p>CO5:Describe the various chemical reactions of the aromatic hydrocarbons.</p> <p>CO6:Gain the knowledge of preparation and chemical reactions of various important organic compounds like halides, aldehydes, ether, phenols, alcohols, etc.</p>	<p>CO4:Study the fundamental aspects of solubility and ionization.</p> <p>CO5:Describe the various chemical reactions of the aromatic hydrocarbons.</p> <p>CO6:Gain the knowledge of preparation and chemical reactions of various important organic compounds like halides, aldehydes, ether, phenols, alcohols, etc.</p>
3	DSC-1002C	Physical and Organic Chemistry	2019-20	<p>CO1:Learn various aspects of solutions and its importance.</p> <p>CO2:Study the electrochemical cell and its conventions and applications in chemistry.</p> <p>CO3:Acquire the aspects of conversion of chemical energy into electrical energy.</p> <p>CO4:Understand phases, components, degrees of freedom, phase diagram and its importance.</p> <p>CO5:Explain the methods of classification and synthesis of aliphatic, aromatic carbohydrates and their derivatives as well as its reactions.</p> <p>CO6:Illustrate the methods of synthesis of amines, diazonium Salts, amino acids, peptides and Proteins.</p>	<p>CO1:Learn various aspects of solutions and its importance.</p> <p>CO2:Study the electrochemical cell and its conventions and applications in chemistry.</p> <p>CO3:Acquire the aspects of conversion of chemical energy into electrical energy.</p> <p>CO4:Understand phases, components, degrees of freedom, phase diagram and its importance.</p> <p>CO5:Explain the methods of classification and synthesis of aliphatic, aromatic carbohydrates and their derivatives as well as its reactions.</p> <p>CO6:Illustrate the methods of synthesis of amines, diazonium Salts, amino acids, peptides and Proteins.</p>	<p>CO1:Learn various aspects of solutions and its importance.</p> <p>CO2:Study the electrochemical cell and its conventions and applications in chemistry.</p> <p>CO3:Acquire the aspects of conversion of chemical energy into electrical energy.</p> <p>CO4:Understand phases, components, degrees of freedom, phase diagram and its importance.</p> <p>CO5:Explain the methods of classification and synthesis of aliphatic, aromatic carbohydrates and their derivatives as well as its reactions.</p> <p>CO6:Illustrate the methods of synthesis of amines, diazonium Salts, amino acids, peptides and Proteins.</p>
4	DSC-1002D	Inorganic and Physical Chemistry	2019-20	<p>CO1:Understand general group trends of 3d transitions series, actinoids and lanthanoids.</p> <p>CO2:Calculate crystal field stabilization energy of tetrahedral and octahedral inorganic complexes and hence stability.</p> <p>CO3:Learn fundamentals of structural properties of various coordination complexes.</p> <p>CO4:Explain the aspects of kinetic theory of gases and its importance.</p>	<p>CO1:Understand general group trends of 3d transitions series, actinoids and lanthanoids.</p> <p>CO2:Calculate crystal field stabilization energy of tetrahedral and octahedral inorganic complexes and hence stability.</p> <p>CO3:Learn fundamentals of structural properties of various coordination complexes.</p> <p>CO4:Explain the aspects of kinetic theory of gases and its importance.</p>	<p>CO1:Understand general group trends of 3d transitions series, actinoids and lanthanoids.</p> <p>CO2:Calculate crystal field stabilization energy of tetrahedral and octahedral inorganic complexes and hence stability.</p> <p>CO3:Learn fundamentals of structural properties of various coordination complexes.</p> <p>CO4:Explain the aspects of kinetic theory of gases and its importance.</p>
5	SEC-SD	Basics in Chemistry	2019-20	<p>CO1:Recognize and predict the products of different types of chemical reactions, such as synthesis, decomposition, acid-base, and redox reactions.</p> <p>CO2:Understand ethical considerations in scientific research and applications of chemistry.</p>	<p>CO1:Recognize and predict the products of different types of chemical reactions, such as synthesis, decomposition, acid-base, and redox reactions.</p> <p>CO2:Understand ethical considerations in scientific research and applications of chemistry.</p>	<p>CO1:Recognize and predict the products of different types of chemical reactions, such as synthesis, decomposition, acid-base, and redox reactions.</p> <p>CO2:Understand ethical considerations in scientific research and applications of chemistry.</p>
6	DSC-1002E1	Physical and Inorganic Chemistry	2020-21	<p>CO1:Understand the wave mechanics of atomic structure.</p> <p>CO2:Know the phenomenon related to the micro particle like electrons.</p>	<p>CO1:Understand the wave mechanics of atomic structure.</p> <p>CO2:Know the phenomenon related to the micro particle like electrons.</p>	<p>CO1:Understand the wave mechanics of atomic structure.</p> <p>CO2:Know the phenomenon related to the micro particle like electrons.</p>

				<p>CO3:Acquire the fundamentals behinds the spectroscopic techniques like Raman, electronics and vibrational spectroscopy.</p> <p>CO4:Adopt the basics of photochemistry.</p> <p>CO5:Study the theory of the reaction rates.</p> <p>CO6:Learn the basic of structure and defects in crystals.</p> <p>CO7:Describe the synthesis and applications of the semiconductors and superconductors in electrical and electronic devices.</p> <p>CO8:Impart essential knowledge regarding classification, types, mechanism and applications of catalyst in industrial fields.</p> <p>CO9:Improve the level of understanding of structure, method of preparation and applications of organometallic compounds in various fields.</p> <p>CO10:Gain thorough knowledge of role of various metals and nonmetals in our health.</p>	<p>CO3:Acquire the fundamentals behinds the spectroscopic techniques like Raman, electronics and vibrational spectroscopy.</p> <p>CO4:Adopt the basics of photochemistry.</p> <p>CO5:Study the theory of the reaction rates.</p> <p>CO6:Learn the basic of structure and defects in crystals.</p> <p>CO7:Describe the synthesis and applications of the semiconductors and superconductors in electrical and electronic devices.</p> <p>CO8:Impart essential knowledge regarding classification, types, mechanism and applications of catalyst in industrial fields.</p> <p>CO9:Improve the level of understanding of structure, method of preparation and applications of organometallic compounds in various fields.</p> <p>CO10:Gain thorough knowledge of role of various metals and nonmetals in our health.</p>	<p>CO3:Acquire the fundamentals behinds the spectroscopic techniques like Raman, electronics and vibrational spectroscopy.</p> <p>CO4:Adopt the basics of photochemistry.</p> <p>CO5:Study the theory of the reaction rates.</p> <p>CO6:Learn the basic of structure and defects in crystals.</p> <p>CO7:Describe the synthesis and applications of the semiconductors and superconductors in electrical and electronic devices.</p> <p>CO8:Impart essential knowledge regarding classification, types, mechanism and applications of catalyst in industrial fields.</p> <p>CO9:Improve the level of understanding of structure, method of preparation and applications of organometallic compounds in various fields.</p> <p>CO10:Gain thorough knowledge of role of various metals and nonmetals in our health.</p>
7	DSC-1002E2	Organic and Analytical Chemistry	2020-21	<p>CO1:Learn mechanism of different organic name reactions and to become confident to solve the problems based on the reactions.</p> <p>CO2:Adopt the utility of reagents in organic synthesis.</p> <p>CO3:Understand the fundamentals of terpenoids and alkaloids.</p> <p>CO4:Describe the applications of nucleophilic substitution reactions of aromatic compounds.</p> <p>CO5:Acquire the knowledge of pharmaceuticals and its use.</p> <p>CO6:Discuss the basic concepts of qualitative and quantitative analysis.</p> <p>CO7:Demonstrate the skills of titrimetric and gravimetric analysis.</p> <p>CO8:Develop the skills of potentiometric and colorimetric analysis.</p> <p>CO9:Illustrate the separation techniques such as paper and thin layer chromatography.</p>	<p>CO1:Learn mechanism of different organic name reactions and to become confident to solve the problems based on the reactions.</p> <p>CO2:Adopt the utility of reagents in organic synthesis.</p> <p>CO3:Understand the fundamentals of terpenoids and alkaloids.</p> <p>CO4:Describe the applications of nucleophilic substitution reactions of aromatic compounds.</p> <p>CO5:Acquire the knowledge of pharmaceuticals and its use.</p> <p>CO6:Discuss the basic concepts of qualitative and quantitative analysis.</p> <p>CO7:Demonstrate the skills of titrimetric and gravimetric analysis.</p> <p>CO8:Develop the skills of potentiometric and colorimetric analysis.</p> <p>CO9:Illustrate the separation techniques such as paper and thin layer chromatography.</p>	<p>CO1:Learn mechanism of different organic name reactions and to become confident to solve the problems based on the reactions.</p> <p>CO2:Adopt the utility of reagents in organic synthesis.</p> <p>CO3:Understand the fundamentals of terpenoids and alkaloids.</p> <p>CO4:Describe the applications of nucleophilic substitution reactions of aromatic compounds.</p> <p>CO5:Acquire the knowledge of pharmaceuticals and its use.</p> <p>CO6:Discuss the basic concepts of qualitative and quantitative analysis.</p> <p>CO7:Demonstrate the skills of titrimetric and gravimetric analysis.</p> <p>CO8:Develop the skills of potentiometric and colorimetric analysis.</p> <p>CO9:Illustrate the separation techniques such as paper and thin layer chromatography.</p>
8	SEC-SE	Basic Analytical Chemistry	2020-21	<p>CO1:Understand and implement quality control and assurance measures in analytical processes to ensure the reliability and precision of results, aligning with industry standards.</p> <p>CO2:Understand the principles and operation of common analytical instruments,</p> <p>Develop hands-on skills in operating common analytical instruments, such as spectrophotometers, chromatographs, and titration</p>	<p>CO1:Understand and implement quality control and assurance measures in analytical processes to ensure the reliability and precision of results, aligning with industry standards.</p> <p>CO2:Understand the principles and operation of common analytical instruments,</p> <p>Develop hands-on skills in operating common analytical instruments, such as spectrophotometers, chromatographs, and titration</p>	<p>CO1:Understand and implement quality control and assurance measures in analytical processes to ensure the reliability and precision of results, aligning with industry standards.</p> <p>CO2:Understand the principles and operation of common analytical instruments,</p> <p>Develop hands-on skills in operating common analytical instruments, such as spectrophotometers,</p>

				setups, ensuring competence in practical laboratory techniques.	setups, ensuring competence in practical laboratory techniques.	chromatographs, and titration setups, ensuring competence in practical laboratory techniques.
9	DSC-1002F1	Physical and Inorganic Chemistry	2020-21	<p>CO1: Understand the theoretical aspect of chemical transformation.</p> <p>CO2: Recognize about surface phenomenon and isotherms of surface reactions.</p> <p>CO3: Describe the methods of detections of radioactivity of the samples.</p> <p>CO4: Demonstrate the working principle of cells and batteries.</p> <p>CO5: Explain the chemistry behind the ethanol fermentation by anaerobic bacteria.</p> <p>CO6: Get idea about theories, factors and knowledge of prevention from corrosion.</p> <p>CO7: Gain the knowledge about ligands, chelates, classification and applications of chelating agents in analytical chemistry.</p> <p>CO8: Develop interest in various nuclear reactions and role of radio isotopes in medicinal, industrial and archaeology fields.</p> <p>CO9: Study the important aspects of the mechanism of the reactions involved in inorganic complexes of transition metals.</p> <p>CO10: Acquire a basic understanding of nanochemistry, nanotechnology and its fascinating aspects.</p>	<p>CO1: Understand the theoretical aspect of chemical transformation.</p> <p>CO2: Recognize about surface phenomenon and isotherms of surface reactions.</p> <p>CO3: Describe the methods of detections of radioactivity of the samples.</p> <p>CO4: Demonstrate the working principle of cells and batteries.</p> <p>CO5: Explain the chemistry behind the ethanol fermentation by anaerobic bacteria.</p> <p>CO6: Get idea about theories, factors and knowledge of prevention from corrosion.</p> <p>CO7: Gain the knowledge about ligands, chelates, classification and applications of chelating agents in analytical chemistry.</p> <p>CO8: Develop interest in various nuclear reactions and role of radio isotopes in medicinal, industrial and archaeology fields.</p> <p>CO9: Study the important aspects of the mechanism of the reactions involved in inorganic complexes of transition metals.</p> <p>CO10: Acquire a basic understanding of nanochemistry, nanotechnology and its fascinating aspects.</p>	<p>CO1: Understand the theoretical aspect of chemical transformation.</p> <p>CO2: Recognize about surface phenomenon and isotherms of surface reactions.</p> <p>CO3: Describe the methods of detections of radioactivity of the samples.</p> <p>CO4: Demonstrate the working principle of cells and batteries.</p> <p>CO5: Explain the chemistry behind the ethanol fermentation by anaerobic bacteria.</p> <p>CO6: Get idea about theories, factors and knowledge of prevention from corrosion.</p> <p>CO7: Gain the knowledge about ligands, chelates, classification and applications of chelating agents in analytical chemistry.</p> <p>CO8: Develop interest in various nuclear reactions and role of radio isotopes in medicinal, industrial and archaeology fields.</p> <p>CO9: Study the important aspects of the mechanism of the reactions involved in inorganic complexes of transition metals.</p> <p>CO10: Acquire a basic understanding of nanochemistry, nanotechnology and its fascinating aspects.</p>
10	DSC-1002F2	Organic Spectroscopic Techniques & Industrial Chemistry	2020-21	<p>CO1: Understand the basic concepts of spectroscopy.</p> <p>CO2: Acquire the knowledge of various spectroscopic techniques such as UV, IR, NMR and Mass Spectroscopy.</p> <p>CO3: Interpret molecular structures by using spectroscopic techniques.</p> <p>CO4: Understand the basics of industrial chemistry.</p> <p>CO5: Learn the manufacturing processes of heavy chemicals.</p> <p>CO6: Adopt the knowledge of sugar and jaggery industry.</p> <p>CO7: Learn and understand fermentation processes involved in manufacturing of alcohol.</p> <p>CO8: Illustrate the overall information regarding manufacture of fertilizers.</p>	<p>CO1: Understand the basic concepts of spectroscopy.</p> <p>CO2: Acquire the knowledge of various spectroscopic techniques such as UV, IR, NMR and Mass Spectroscopy.</p> <p>CO3: Interpret molecular structures by using spectroscopic techniques.</p> <p>CO4: Understand the basics of industrial chemistry.</p> <p>CO5: Learn the manufacturing processes of heavy chemicals.</p> <p>CO6: Adopt the knowledge of sugar and jaggery industry.</p> <p>CO7: Learn and understand fermentation processes involved in manufacturing of alcohol.</p> <p>CO8: Illustrate the overall information regarding manufacture of fertilizers.</p>	<p>CO1: Understand the basic concepts of spectroscopy.</p> <p>CO2: Acquire the knowledge of various spectroscopic techniques such as UV, IR, NMR and Mass Spectroscopy.</p> <p>CO3: Interpret molecular structures by using spectroscopic techniques.</p> <p>CO4: Understand the basics of industrial chemistry.</p> <p>CO5: Learn the manufacturing processes of heavy chemicals.</p> <p>CO6: Adopt the knowledge of sugar and jaggery industry.</p> <p>CO7: Learn and understand fermentation processes involved in manufacturing of alcohol.</p> <p>CO8: Illustrate the overall information regarding manufacture of fertilizers.</p>

11	SEC-SF	Project work and industrial study tour	2020-21	<p>CO4: Gain familiarity with basic analytical techniques such as spectroscopy, chromatography, and titration.</p> <p>CO5: Cultivate an entrepreneurial mindset by exploring potential applications of analytical chemistry in various industries</p>	<p>CO4: Gain familiarity with basic analytical techniques such as spectroscopy, chromatography, and titration.</p> <p>CO5: Cultivate an entrepreneurial mindset by exploring potential applications of analytical chemistry in various industries</p>	<p>CO4: Gain familiarity with basic analytical techniques such as spectroscopy, chromatography, and titration.</p> <p>CO5: Cultivate an entrepreneurial mindset by exploring potential applications of analytical chemistry in various industries</p>
B. Sc. Chemistry (Revised I Between 2021-22 and 2023-24)						
12	DSC-1002A	<p>Section-I Inorganic Chemistry</p> <p>Section-II Organic Chemistry</p>	2021-22	<p>CO1: Adopt the fundamental concepts about atomic structure and general trends in periodic table.</p> <p>CO2: Discuss the aspects in Ionic bonding, Molecular orbital theory and valence bond theory.</p> <p>CO3: Learn the fundamental concepts in organic chemistry, aromaticity and stereochemistry.</p> <p>CO4: Understand the different methods of synthesis of various organic compounds - Aldehydes and ketones.</p>	<p>CO1: Adopt the fundamental concepts about atomic structure and general trends in periodic table.</p> <p>CO2: Discuss the aspects in Ionic bonding, Molecular orbital theory and valence bond theory.</p> <p>CO3: Learn the fundamental concepts in organic chemistry, aromaticity and stereochemistry.</p> <p>CO4: Understand the different methods of synthesis of various organic compounds - Aldehydes and ketones.</p>	<p>CO1: Adopt the fundamental concepts about atomic structure and general trends in periodic table.</p> <p>CO2: Discuss the aspects in Ionic bonding, Molecular orbital theory and valence bond theory.</p> <p>CO3: Learn the fundamental concepts in organic chemistry, aromaticity and stereochemistry.</p> <p>CO4: Understand the different methods of synthesis of various organic compounds - Aldehydes and ketones.</p>
13	DSC-1002B	<p>Section-I Physical Chemistry</p> <p>Section-II Analytical & Industrial Chemistry</p>	2021-22	<p>CO1: Understand the laws of thermodynamics, various aspects of enthalpy and free energy.</p> <p>CO2: Acquire the knowledge about Chemical Kinetics, Thermochemistry and Nuclear chemistry.</p> <p>CO3: Acquire fundamental skills required for Analytical & Industrial chemistry</p> <p>CO4: Gain the knowledge about various techniques in Chromatography.</p> <p>CO3 Study the various aspects in Dairy and Leather chemistry.</p>	<p>CO1: Understand the laws of thermodynamics, various aspects of enthalpy and free energy.</p> <p>CO2: Acquire the knowledge about Chemical Kinetics, Thermochemistry and Nuclear chemistry.</p> <p>CO3: Acquire fundamental skills required for Analytical & Industrial chemistry</p> <p>CO4: Gain the knowledge about various techniques in Chromatography.</p> <p>CO3 Study the various aspects in Dairy and Leather chemistry.</p>	<p>CO1: Understand the laws of thermodynamics, various aspects of enthalpy and free energy.</p> <p>CO2: Acquire the knowledge about Chemical Kinetics, Thermochemistry and Nuclear chemistry.</p> <p>CO3: Acquire fundamental skills required for Analytical & Industrial chemistry</p> <p>CO4: Gain the knowledge about various techniques in Chromatography.</p> <p>CO3 Study the various aspects in Dairy and Leather chemistry.</p>
14	DSC-1002C	<p>Section-I Physical Chemistry</p> <p>Section-II Analytical & Industrial Chemistry</p>	2022-23	<p>CO1: Acquire knowledge regarding properties of matter.</p> <p>CO2: Enhance critical thinking and problem solving ability.</p> <p>CO3: Acquire skills of instrumental and non-instrumental analytical techniques.</p> <p>CO4: Understand basics of industrial manufacturing processes.</p>	<p>CO1: Acquire knowledge regarding properties of matter.</p> <p>CO2: Enhance critical thinking and problem solving ability.</p> <p>CO3: Acquire skills of instrumental and non-instrumental analytical techniques.</p> <p>CO4: Understand basics of industrial manufacturing processes.</p>	<p>CO1: Acquire knowledge regarding properties of matter.</p> <p>CO2: Enhance critical thinking and problem solving ability.</p> <p>CO3: Acquire skills of instrumental and non-instrumental analytical techniques.</p> <p>CO4: Understand basics of industrial manufacturing processes.</p>
15	DSC-1002C	<p>Section-I Inorganic Chemistry</p> <p>Section-II Organic Chemistry</p>	2022-23	<p>CO1: Gain the knowledge of p & d-block elements.</p> <p>CO2: Develop the basics, theories and applications of co-ordination compounds and metal-chelates.</p> <p>CO3: Prepare different organic compounds.</p>	<p>CO1: Gain the knowledge of p & d-block elements.</p> <p>CO2: Develop the basics, theories and applications of co-ordination compounds and metal-chelates.</p> <p>CO3: Prepare different organic compounds.</p>	<p>CO1: Gain the knowledge of p & d-block elements.</p> <p>CO2: Develop the basics, theories and applications of co-ordination compounds and metal-chelates.</p> <p>CO3: Prepare different organic compounds.</p>

				<p>CO4: Acquire knowledge of application and utilization of organic compounds.</p> <p>CO5: Understand the structure, types and reactions of biomolecules.</p>	<p>CO4: Acquire knowledge of application and utilization of organic compounds.</p> <p>CO5: Understand the structure, types and reactions of biomolecules.</p>	<p>CO4: Acquire knowledge of application and utilization of organic compounds.</p> <p>CO5: Understand the structure, types and reactions of biomolecules.</p>
16	SEC-SD	Basics in Chemistry	2022-23	<p>CO1: Recognize and predict the products of different types of chemical reactions, such as synthesis, decomposition, acid-base, and redox reactions.</p> <p>CO2: Understand ethical considerations in scientific research and applications of chemistry.</p>	<p>CO1: Recognize and predict the products of different types of chemical reactions, such as synthesis, decomposition, acid-base, and redox reactions.</p> <p>CO2: Understand ethical considerations in scientific research and applications of chemistry.</p>	<p>CO1: Recognize and predict the products of different types of chemical reactions, such as synthesis, decomposition, acid-base, and redox reactions.</p> <p>CO2: Understand ethical considerations in scientific research and applications of chemistry.</p>
17	DSC-1002E1	Section-I Physical Chemistry Section-II Inorganic Chemistry	2023-24	<p>CO1: Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, physical interpretation of the ψ and ψ^2 and particle in a one dimensional box.</p> <p>CO2: Acquire knowledge about spectroscopy, Electromagnetic spectrum, Energy level diagram, Study of rotational spectra of diatomic molecules: Rigid rotor model, Microwave oven, vibrational spectra of diatomic molecules, simple Harmonic oscillator model, Raman spectra: Concept of polarizability, pure rotational and pure Vibrational Raman spectra of diatomic molecules.</p> <p>CO3: Impart and understand photochemical laws, reactions and various photochemical phenomena.</p> <p>CO4: Gain and understand the knowledge of emf measurements, types of electrodes, different types of cells, various applications of emf measurements.</p> <p>CO5: Understand the role of acids and bases as well as all chemical properties of solutes in Chemistry.</p> <p>CO6: Gain and understand the synthesis and applications of the semiconductors and superconductors in electrical and electronic devices. Also get a basic understanding of nanochemistry, nanotechnology and its fascinating aspects.</p> <p>CO7: Improve the level of understanding of structure, method of preparation and applications of organometallic compounds in various fields.</p>	<p>CO1: Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, physical interpretation of the ψ and ψ^2 and particle in a one dimensional box.</p> <p>CO2: Acquire knowledge about spectroscopy, Electromagnetic spectrum, Energy level diagram, Study of rotational spectra of diatomic molecules: Rigid rotor model, Microwave oven, vibrational spectra of diatomic molecules, simple Harmonic oscillator model, Raman spectra: Concept of polarizability, pure rotational and pure Vibrational Raman spectra of diatomic molecules.</p> <p>CO3: Impart and understand photochemical laws, reactions and various photochemical phenomena.</p> <p>CO4: Gain and understand the knowledge of emf measurements, types of electrodes, different types of cells, various applications of emf measurements.</p> <p>CO5: Understand the role of acids and bases as well as all chemical properties of solutes in Chemistry.</p> <p>CO6: Gain and understand the synthesis and applications of the semiconductors and superconductors in electrical and electronic devices. Also get a basic understanding of nanochemistry, nanotechnology and its fascinating aspects.</p> <p>CO7: Improve the level of understanding of structure, method of preparation and applications of organometallic compounds in various fields.</p>	<p>CO1: Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, physical interpretation of the ψ and ψ^2 and particle in a one dimensional box.</p> <p>CO2: Acquire knowledge about spectroscopy, Electromagnetic spectrum, Energy level diagram, Study of rotational spectra of diatomic molecules: Rigid rotor model, Microwave oven, vibrational spectra of diatomic molecules, simple Harmonic oscillator model, Raman spectra: Concept of polarizability, pure rotational and pure Vibrational Raman spectra of diatomic molecules.</p> <p>CO3: Impart and understand photochemical laws, reactions and various photochemical phenomena.</p> <p>CO4: Gain and understand the knowledge of emf measurements, types of electrodes, different types of cells, various applications of emf measurements.</p> <p>CO5: Understand the role of acids and bases as well as all chemical properties of solutes in Chemistry.</p> <p>CO6: Gain and understand the synthesis and applications of the semiconductors and superconductors in electrical and electronic devices. Also get a basic understanding of nanochemistry, nanotechnology and its fascinating aspects.</p> <p>CO7: Improve the level of understanding of structure, method of preparation and applications of organometallic compounds in various fields.</p> <p>CO8: Impart essential knowledge regarding classification, types, mechanism and applications of catalyst in industrial fields.</p>

				<p>CO8: Impart essential knowledge regarding classification, types, mechanism and applications of catalyst in industrial fields.</p> <p>CO9: Learn geometry, stability, colour and nature of bonding between metal ion and ligand in complexes.</p>	<p>CO8: Impart essential knowledge regarding classification, types, mechanism and applications of catalyst in industrial fields.</p> <p>CO9: Learn geometry, stability, colour and nature of bonding between metal ion and ligand in complexes.</p>	<p>CO9: Learn geometry, stability, colour and nature of bonding between metal ion and ligand in complexes.</p>
18	DSC-1002E2	<p>Section-I Organic Chemistry</p> <p>Section-II Analytical Chemistry</p>	2023-24	<p>CO1: Acquire knowledge of various spectroscopic techniques such as UV, IR, NMR and Mass Spectroscopy.</p> <p>CO2: Interpret molecular structural formula by using spectroscopic techniques.</p> <p>CO3: Make the solutions and find the structures of unknown organic compounds on the basis of IR, NMR, UV and Mass spectroscopic data.</p> <p>CO4: Acquire knowledge of theoretical and practical aspects of Soil, water and fertilizers analysis.</p> <p>CO5: Adopt skills of various analytical techniques such as Flame photometry, potentiometry and colorimetry.</p> <p>CO6: Learn various aspects to apply analytical techniques to analysed the samples.</p>	<p>CO1: Acquire knowledge of various spectroscopic techniques such as UV, IR, NMR and Mass Spectroscopy.</p> <p>CO2: Interpret molecular structural formula by using spectroscopic techniques.</p> <p>CO3: Make the solutions and find the structures of unknown organic compounds on the basis of IR, NMR, UV and Mass spectroscopic data.</p> <p>CO4: Acquire knowledge of theoretical and practical aspects of Soil, water and fertilizers analysis.</p> <p>CO5: Adopt skills of various analytical techniques such as Flame photometry, potentiometry and colorimetry.</p> <p>CO6: Learn various aspects to apply analytical techniques to analysed the samples.</p>	<p>CO1: Acquire knowledge of various spectroscopic techniques such as UV, IR, NMR and Mass Spectroscopy.</p> <p>CO2: Interpret molecular structural formula by using spectroscopic techniques.</p> <p>CO3: Make the solutions and find the structures of unknown organic compounds on the basis of IR, NMR, UV and Mass spectroscopic data.</p> <p>CO4: Acquire knowledge of theoretical and practical aspects of Soil, water and fertilizers analysis.</p> <p>CO5: Adopt skills of various analytical techniques such as Flame photometry, potentiometry and colorimetry.</p> <p>CO6: Learn various aspects to apply analytical techniques to analysed the samples.</p>
19	SEC-SE	<p>SEC: Laboratory Safety Management</p>	2023-24	<p>CO1: Demonstrate a comprehensive understanding of laboratory safety principles and protocols, hazardous chemicals and routes of entry for toxins.</p> <p>CO2: Learn about MSDS and Laboratory safety symbols.</p> <p>CO3: Acquire the knowledge of Prevention of Accidents and First Aid Measures in the laboratory.</p> <p>CO4: Understand the Safe Handling of Chemicals and waste management in the laboratory.</p>	<p>CO1: Demonstrate a comprehensive understanding of laboratory safety principles and protocols, hazardous chemicals and routes of entry for toxins.</p> <p>CO2: Learn about MSDS and Laboratory safety symbols.</p> <p>CO3: Acquire the knowledge of Prevention of Accidents and First Aid Measures in the laboratory.</p> <p>CO4: Understand the Safe Handling of Chemicals and waste management in the laboratory.</p>	<p>CO1: Demonstrate a comprehensive understanding of laboratory safety principles and protocols, hazardous chemicals and routes of entry for toxins.</p> <p>CO2: Learn about MSDS and Laboratory safety symbols.</p> <p>CO3: Acquire the knowledge of Prevention of Accidents and First Aid Measures in the laboratory.</p> <p>CO4: Understand the Safe Handling of Chemicals and waste management in the laboratory.</p>
20	DSC-1002F1	<p>Section-I Physical Chemistry</p> <p>Section-II Inorganic Chemistry</p>		<p>CO1: Acquire knowledge about basic concept of adsorption, types of adsorption, Freundlich, Langmuir adsorption isotherm and BET equation.</p> <p>CO2: Gain the knowledge about basic concept of Thermodynamics, free energy, Gibbs-Helmholtz equation and its applications, problem related with it.</p> <p>CO3: Learn and understand Space lattice, lattice sites, Lattice planes, Unit cell, Laws of crystallography, Weiss indices and Miller indices, Cubic lattices and types of cubic lattice, planes or</p>	<p>CO1: Acquire knowledge about basic concept of adsorption, types of adsorption, Freundlich, Langmuir adsorption isotherm and BET equation.</p> <p>CO2: Gain the knowledge about basic concept of Thermodynamics, free energy, Gibbs-Helmholtz equation and its applications, problem related with it.</p> <p>CO3: Learn and understand Space lattice, lattice sites, Lattice planes, Unit cell, Laws of crystallography, Weiss indices and Miller indices, Cubic lattices and types of cubic lattice, planes or</p>	<p>CO1: Acquire knowledge about basic concept of adsorption, types of adsorption, Freundlich, Langmuir adsorption isotherm and BET equation.</p> <p>CO2: Gain the knowledge about basic concept of Thermodynamics, free energy, Gibbs-Helmholtz equation and its applications, problem related with it.</p> <p>CO3: Learn and understand Space lattice, lattice sites, Lattice planes, Unit cell, Laws of crystallography, Weiss indices and Miller indices, Cubic lattices and types of cubic lattice, planes or</p>

			<p>2023-24</p> <p>faces of a simple cubic system, Diffraction of X-rays, Derivation of Bragg's equation, Determination of crystal structure by Bragg's method, crystal structure of NaCl and KCl on the basis of Bragg's equation.</p> <p>CO4: Understand the kinetics, Simultaneous reactions such as i) opposing reaction ii) side reaction iii) consecutive reaction iv) chain reaction v) explosive reaction.</p> <p>CO5: Adopt the knowledge about scintillation counter and Geiger counter method and range of α-particles, Geiger Nuttall relation, Decay constant.</p> <p>CO6: Acquire the important aspects of the mechanism of reactions involved in inorganic complexes of transition metals as well as thermodynamic and kinetic aspects of metal complexes.</p> <p>CO7: Develop interest in various nuclear reactions and role of radio isotopes in medicinal, industrial and archaeology fields.</p> <p>CO8: Impart essential knowledge regarding the characteristics, properties and separation of lanthanides and actinides, synthesis and IUPAC Nomenclature of transuranic elements (TU).</p> <p>CO9: Improve the level of understanding of the techniques involved in ore dressing and extraction of cast iron from its ore.</p> <p>CO10: Gain a thorough knowledge about role of various metals and non metals in our health.</p>	<p>faces of a simple cubic system, Diffraction of X-rays, Derivation of Bragg's equation, Determination of crystal structure by Bragg's method, crystal structure of NaCl and KCl on the basis of Bragg's equation.</p> <p>CO4: Understand the kinetics, Simultaneous reactions such as i) opposing reaction ii) side reaction iii) consecutive reaction iv) chain reaction v) explosive reaction.</p> <p>CO5: Adopt the knowledge about scintillation counter and Geiger counter method and range of α-particles, Geiger Nuttall relation, Decay constant.</p> <p>CO6: Acquire the important aspects of the mechanism of reactions involved in inorganic complexes of transition metals as well as thermodynamic and kinetic aspects of metal complexes.</p> <p>CO7: Develop interest in various nuclear reactions and role of radio isotopes in medicinal, industrial and archaeology fields.</p> <p>CO8: Impart essential knowledge regarding the characteristics, properties and separation of lanthanides and actinides, synthesis and IUPAC Nomenclature of transuranic elements (TU).</p> <p>CO9: Improve the level of understanding of the techniques involved in ore dressing and extraction of cast iron from its ore.</p> <p>CO10: Gain a thorough knowledge about role of various metals and non metals in our health.</p>	<p>faces of a simple cubic system, Diffraction of X-rays, Derivation of Bragg's equation, Determination of crystal structure by Bragg's method, crystal structure of NaCl and KCl on the basis of Bragg's equation.</p> <p>CO4: Understand the kinetics, Simultaneous reactions such as i) opposing reaction ii) side reaction iii) consecutive reaction iv) chain reaction v) explosive reaction.</p> <p>CO5: Adopt the knowledge about scintillation counter and Geiger counter method and range of α-particles, Geiger Nuttall relation, Decay constant.</p> <p>CO6: Acquire the important aspects of the mechanism of reactions involved in inorganic complexes of transition metals as well as thermodynamic and kinetic aspects of metal complexes.</p> <p>CO7: Develop interest in various nuclear reactions and role of radio isotopes in medicinal, industrial and archaeology fields.</p> <p>CO8: Impart essential knowledge regarding the characteristics, properties and separation of lanthanides and actinides, synthesis and IUPAC Nomenclature of transuranic elements (TU).</p> <p>CO9: Improve the level of understanding of the techniques involved in ore dressing and extraction of cast iron from its ore.</p> <p>CO10: Gain a thorough knowledge about role of various metals and non metals in our health.</p>
21	DSC-1002F2	<p>Section-I</p> <p>Organic Chemistry</p> <p>Section-II</p> <p>Industrial Chemistry</p>	<p>2023-24</p> <p>CO1: Learn the mechanism of different organic name reactions and to become confident to solve the problems based on the reactions.</p> <p>CO2: Adopt the utility of reagents in organic synthesis.</p> <p>CO3: Understand the fundamentals of terpenoids and alkaloids.</p> <p>CO4: Illustrate the applications of nucleophilic substitution reactions of aromatic compounds.</p> <p>CO5: Acquire knowledge of pharmaceuticals and its use.</p> <p>CO6: Understand the basics of industrial chemistry.</p> <p>CO7: Learn the manufacturing processes of heavy chemicals.</p> <p>CO8: Acquire knowledge of sugar and jaggery industry.</p>	<p>CO1: Learn the mechanism of different organic name reactions and to become confident to solve the problems based on the reactions.</p> <p>CO2: Adopt the utility of reagents in organic synthesis.</p> <p>CO3: Understand the fundamentals of terpenoids and alkaloids.</p> <p>CO4: Illustrate the applications of nucleophilic substitution reactions of aromatic compounds.</p> <p>CO5: Acquire knowledge of pharmaceuticals and its use.</p> <p>CO6: Understand the basics of industrial chemistry.</p> <p>CO7: Learn the manufacturing processes of heavy chemicals.</p> <p>CO8: Acquire knowledge of sugar and jaggery industry.</p>	<p>CO1: Learn the mechanism of different organic name reactions and to become confident to solve the problems based on the reactions.</p> <p>CO2: Adopt the utility of reagents in organic synthesis.</p> <p>CO3: Understand the fundamentals of terpenoids and alkaloids.</p> <p>CO4: Illustrate the applications of nucleophilic substitution reactions of aromatic compounds.</p> <p>CO5: Acquire knowledge of pharmaceuticals and its use.</p> <p>CO6: Understand the basics of industrial chemistry.</p> <p>CO7: Learn the manufacturing processes of heavy chemicals.</p> <p>CO8: Acquire knowledge of sugar and jaggery industry.</p>

				<p>CO9: Gain and understand fermentation processes involved in manufacturing of alcohol.</p> <p>CO5 Illustrate overall information regarding manufacture of fertilizers.</p>	<p>CO9: Gain and understand fermentation processes involved in manufacturing of alcohol.</p> <p>CO5 Illustrate overall information regarding manufacture of fertilizers.</p>	<p>CO9: Gain and understand fermentation processes involved in manufacturing of alcohol.</p> <p>CO5 Illustrate overall information regarding manufacture of fertilizers.</p>
22	SEC-SF	Project work and industrial study tour	2020-21	<p>CO4: Gain familiarity with basic analytical techniques such as spectroscopy, chromatography, and titration.</p> <p>CO5: Cultivate an entrepreneurial mindset by exploring potential applications of analytical chemistry in various industries</p>	<p>CO4: Gain familiarity with basic analytical techniques such as spectroscopy, chromatography, and titration.</p> <p>CO5: Cultivate an entrepreneurial mindset by exploring potential applications of analytical chemistry in various industries</p>	<p>CO4: Gain familiarity with basic analytical techniques such as spectroscopy, chromatography, and titration.</p> <p>CO5: Cultivate an entrepreneurial mindset by exploring potential applications of analytical chemistry in various industries</p>

Sr. No.	Course Code	Course / SECs Titles	Year of Introduction	COs and PSOs with relevance to local/regional needs	COs & PSOs with relevance to national needs	COs & PSOs with relevance to global needs
M. Sc. Chemistry (Newly Introduced Between 2018-19 and 2023-24)						
1	CC-1131A	Inorganic Chemistry – I	2018-19	<p>CO1: Learn the symmetry elements and symmetry operations of various inorganic compounds.</p> <p>CO2: Understand the spatial arrangement and nature of bonding in case of main group compounds.</p> <p>CO3: Acquire the knowledge of bio inorganic chemistry and transition elements.</p> <p>CO4: Study the electronic, electric and optical behaviour of Inorganic materials.</p>	<p>CO1: Learn the symmetry elements and symmetry operations of various inorganic compounds.</p> <p>CO2: Understand the spatial arrangement and nature of bonding in case of main group compounds.</p> <p>CO3: Acquire the knowledge of bio inorganic chemistry and transition elements.</p> <p>CO4: Study the electronic, electric and optical behaviour of Inorganic materials.</p>	<p>CO1: Learn the symmetry elements and symmetry operations of various inorganic compounds.</p> <p>CO2: Understand the spatial arrangement and nature of bonding in case of main group compounds.</p> <p>CO3: Acquire the knowledge of bio inorganic chemistry and transition elements.</p> <p>CO4: Study the electronic, electric and optical behaviour of Inorganic materials.</p>
2	CC-1132A	Organic Chemistry	2018-19	<p>CO1: Understand the structure and reactivity of various reactive intermediates as well as stereochemistry of nucleophilic substitution reactions.</p> <p>CO2: Learn the stereochemistry in nucleophilic substitution reactions in aliphatic compounds.</p> <p>CO3: Identify the Electrophilic substitution reactions with respect to aromatic, introduction of benzenoid and non benzenoid aromatic compounds.</p> <p>CO4: Grasp knowledge of new reactions with respect to its stereochemistry and applications.</p> <p>CO5: Study the specificity of elimination reactions.</p> <p>CO6: Assimilate stereochemical aspects of chiral compounds containing heteroatoms and introduction to allenes and spiranes.</p>	<p>CO1: Understand the structure and reactivity of various reactive intermediates as well as stereochemistry of nucleophilic substitution reactions.</p> <p>CO2: Learn the stereochemistry in nucleophilic substitution reactions in aliphatic compounds.</p> <p>CO3: Identify the Electrophilic substitution reactions with respect to aromatic, introduction of benzenoid and non benzenoid aromatic compounds.</p> <p>CO4: Grasp knowledge of new reactions with respect to its stereochemistry and applications.</p> <p>CO5: Study the specificity of elimination reactions.</p> <p>CO6: Assimilate stereochemical aspects of chiral compounds containing heteroatoms and introduction to allenes and spiranes.</p>	<p>CO1: Understand the structure and reactivity of various reactive intermediates as well as stereochemistry of nucleophilic substitution reactions.</p> <p>CO2: Learn the stereochemistry in nucleophilic substitution reactions in aliphatic compounds.</p> <p>CO3: Identify the Electrophilic substitution reactions with respect to aromatic, introduction of benzenoid and non benzenoid aromatic compounds.</p> <p>CO4: Grasp knowledge of new reactions with respect to its stereochemistry and applications.</p> <p>CO5: Study the specificity of elimination reactions.</p> <p>CO6: Assimilate stereochemical aspects of chiral compounds containing heteroatoms and introduction to allenes and spiranes.</p>

3	CC-1133A	Physical Chemistry	2018-19	<p>CO1:Inculcate phenomenon of Molecular spectroscopy.</p> <p>CO2:Study the aspects of polymers and rubber.</p> <p>CO3:Develop the concept of Colloids and surface phenomena.</p> <p>CO4:Learn new concepts in thermodynamics and related properties.</p>	<p>CO1:Inculcate phenomenon of Molecular spectroscopy.</p> <p>CO2:Study the aspects of polymers and rubber.</p> <p>CO3:Develop the concept of Colloids and surface phenomena.</p> <p>CO4:Learn new concepts in thermodynamics and related properties.</p>	<p>CO1:Inculcate phenomenon of Molecular spectroscopy.</p> <p>CO2:Study the aspects of polymers and rubber.</p> <p>CO3:Develop the concept of Colloids and surface phenomena.</p> <p>CO4:Learn new concepts in thermodynamics and related properties.</p>
4	CC-1134A	Analytical Chemistry	2018-19	<p>CO1:Learn concepts of quality control and quality assurance related to analytical chemistry.</p> <p>CO2:Acquire the new hyphenated techniques in chromatography.</p> <p>CO3:Grasp new analytical techniques related to electrochemistry such as voltametry, amperometry and polarography etc.</p> <p>CO4:Adopt research methodology and nanomaterials.</p>	<p>CO1:Learn concepts of quality control and quality assurance related to analytical chemistry.</p> <p>CO2:Acquire the new hyphenated techniques in chromatography.</p> <p>CO3:Grasp new analytical techniques related to electrochemistry such as voltametry, amperometry and polarography etc.</p> <p>CO4:Adopt research methodology and nanomaterials.</p>	<p>CO1:Learn concepts of quality control and quality assurance related to analytical chemistry.</p> <p>CO2:Acquire the new hyphenated techniques in chromatography.</p> <p>CO3:Grasp new analytical techniques related to electrochemistry such as voltametry, amperometry and polarography etc.</p> <p>CO4:Adopt research methodology and nanomaterials.</p>
5	CC-1137B	Inorganic Chemistry – I	2018-19	<p>CO1:Learn the Symmetry elements and symmetry operations of various inorganic compounds.</p> <p>CO2:Adapt knowledge related to organometallic chemistry, transition elements, transition metal complexes</p> <p>CO3:Study related to lanthanides and actinides and get familiar with spectroscopic term symbols, nuclear and radiochemistry</p>	<p>CO1:Learn the Symmetry elements and symmetry operations of various inorganic compounds.</p> <p>CO2:Adapt knowledge related to organometallic chemistry, transition elements, transition metal complexes</p> <p>CO3:Study related to lanthanides and actinides and get familiar with spectroscopic term symbols, nuclear and radiochemistry</p>	<p>CO1:Learn the Symmetry elements and symmetry operations of various inorganic compounds.</p> <p>CO2:Adapt knowledge related to organometallic chemistry, transition elements, transition metal complexes</p> <p>CO3:Study related to lanthanides and actinides and get familiar with spectroscopic term symbols, nuclear and radiochemistry</p>
6	CC-1138B	Organic Chemistry	2018-19	<p>CO1: Assimilate the reaction mechanism with various name reactions, C- alkylation and acylation.</p> <p>CO2: Learn oxidation, hydroboration and enamines.</p> <p>CO3:Study reduction reactions with help of various reducing agents and functional group protection.</p> <p>CO4:Get familiar with the concept of retrosynthetic analysis and organometallic chemistry w.r.t. organic synthesis</p>	<p>CO1: Assimilate the reaction mechanism with various name reactions, C- alkylation and acylation.</p> <p>CO2: Learn oxidation, hydroboration and enamines.</p> <p>CO3:Study reduction reactions with help of various reducing agents and functional group protection.</p> <p>CO4:Get familiar with the concept of retrosynthetic analysis and organometallic chemistry w.r.t. organic synthesis</p>	<p>CO1: Assimilate the reaction mechanism with various name reactions, C- alkylation and acylation.</p> <p>CO2: Learn oxidation, hydroboration and enamines.</p> <p>CO3:Study reduction reactions with help of various reducing agents and functional group protection.</p> <p>CO4:Get familiar with the concept of retrosynthetic analysis and organometallic chemistry w.r.t. organic synthesis</p>
7	CC-1139B	Physical Chemistry	2018-19	<p>CO1:Acquire knowledge related to atomic structure of many electron system.</p> <p>CO2: Get familiar with basics of resonance energy transfer and fluorescence quenching.</p> <p>CO3:Apply electrochemistry basics to determination of activity and activity coefficients of an electrolytes.</p> <p>CO4:Understand the kinetics approach for simultaneous reactions.</p>	<p>CO1:Acquire knowledge related to atomic structure of many electron system.</p> <p>CO2: Get familiar with basics of resonance energy transfer and fluorescence quenching.</p> <p>CO3:Apply electrochemistry basics to determination of activity and activity coefficients of an electrolytes.</p> <p>CO4:Understand the kinetics approach for simultaneous reactions.</p>	<p>CO1:Acquire knowledge related to atomic structure of many electron system.</p> <p>CO2: Get familiar with basics of resonance energy transfer and fluorescence quenching.</p> <p>CO3:Apply electrochemistry basics to determination of activity and activity coefficients of an electrolytes.</p> <p>CO4:Understand the kinetics approach for simultaneous reactions.</p>

8	CC-1140B	Analytical Chemistry	2018-19	<p>CO1: Grasp the fundamentals of molecular spectroscopy.</p> <p>CO2:Apply basics of spectroscopy in structure determination of organic compounds</p> <p>CO3:Use of heat energy in structure determination.</p> <p>CO4:Get familiar with modern techniques such as AAS, ICPS.</p>	<p>CO1: Grasp the fundamentals of molecular spectroscopy.</p> <p>CO2:Apply basics of spectroscopy in structure determination of organic compounds</p> <p>CO3:Use of heat energy in structure determination.</p> <p>CO4:Get familiar with modern techniques such as AAS, ICPS.</p>	<p>CO1: Grasp the fundamentals of molecular spectroscopy.</p> <p>CO2:Apply basics of spectroscopy in structure determination of organic compounds</p> <p>CO3:Use of heat energy in structure determination.</p> <p>CO4:Get familiar with modern techniques such as AAS, ICPS.</p>
9	CC-1143C	Organic Reaction Mechanism	2019-20	<p>CO1: Adopt the knowledge about the path and to determine the rates of reactions by Kinetic and non kinetic methods - steps involved, reaction rate determination, order and molecularity, Testing and trapping of intermediates, stereochemistry and Hammett Taft equation.</p> <p>CO2:Understand the concept of Pericyclic reactions, Woodward Hoffman correlation diagrams – FMO, PMO approach, conrotatory and disrotatory motion. Also identify the reactions as 4n, 4n+2 and 2+2 addition of ketenes, sigmatropic shifts (3,3) and (5,5) Claisen and Cope and Aza Cope rearrangement.</p> <p>CO3:Learn the mechanism and stereochemistry, migratory aptitude and applications of different name reactions like Dienone-phenol, Favorskii, Smiles, Brook, Neber, Stevens, Sommelet - Hoeser rearrangement reaction, etc.</p> <p>CO4:Adapt the knowledge about photochemistry – photochemical reactions, their types and they will come to know the difference between thermal and photochemical reactions, laws of photochemistry. Also know the types of photochemical reactions, quenching and chemiluminescence.</p>	<p>CO1: Adopt the knowledge about the path and to determine the rates of reactions by Kinetic and non kinetic methods - steps involved, reaction rate determination, order and molecularity, Testing and trapping of intermediates, stereochemistry and Hammett Taft equation.</p> <p>CO2:Understand the concept of Pericyclic reactions, Woodward Hoffman correlation diagrams – FMO, PMO approach, conrotatory and disrotatory motion. Also identify the reactions as 4n, 4n+2 and 2+2 addition of ketenes, sigmatropic shifts (3,3) and (5,5) Claisen and Cope and Aza Cope rearrangement.</p> <p>CO3:Learn the mechanism and stereochemistry, migratory aptitude and applications of different name reactions like Dienone-phenol, Favorskii, Smiles, Brook, Neber, Stevens, Sommelet - Hoeser rearrangement reaction, etc.</p> <p>CO4:Adapt the knowledge about photochemistry – photochemical reactions, their types and they will come to know the difference between thermal and photochemical reactions, laws of photochemistry. Also know the types of photochemical reactions, quenching and chemiluminescence.</p>	<p>CO1: Adopt the knowledge about the path and to determine the rates of reactions by Kinetic and non kinetic methods - steps involved, reaction rate determination, order and molecularity, Testing and trapping of intermediates, stereochemistry and Hammett Taft equation.</p> <p>CO2:Understand the concept of Pericyclic reactions, Woodward Hoffman correlation diagrams – FMO, PMO approach, conrotatory and disrotatory motion. Also identify the reactions as 4n, 4n+2 and 2+2 addition of ketenes, sigmatropic shifts (3,3) and (5,5) Claisen and Cope and Aza Cope rearrangement.</p> <p>CO3:Learn the mechanism and stereochemistry, migratory aptitude and applications of different name reactions like Dienone-phenol, Favorskii, Smiles, Brook, Neber, Stevens, Sommelet - Hoeser rearrangement reaction, etc.</p> <p>CO4:Adapt the knowledge about photochemistry – photochemical reactions, their types and they will come to know the difference between thermal and photochemical reactions, laws of photochemistry. Also know the types of photochemical reactions, quenching and chemiluminescence.</p>
10	CC-1144C	Advanced Spectroscopic Methods	2019-20	<p>CO1:Learn the principles and theory behind UV and IR spectroscopy and the concept of molecular vibrations occurring due to absorption of IR radiation and electronic excitations due to absorption of UV radiations so that students will be able to identify the structures of unknown organic compounds. They can identify the functional groups in organic compounds like alcohol, aldehyde, ketone, ester, aromatic compounds etc. They will learn overtones, combination bands and Fermi resonance FT-IR spectroscopic method.</p> <p>CO2:Understand the recapitulation of proton NMR spectroscopy, Factors affecting coupling</p>	<p>CO1:Learn the principles and theory behind UV and IR spectroscopy and the concept of molecular vibrations occurring due to absorption of IR radiation and electronic excitations due to absorption of UV radiations so that students will be able to identify the structures of unknown organic compounds. They can identify the functional groups in organic compounds like alcohol, aldehyde, ketone, ester, aromatic compounds etc. They will learn overtones, combination bands and Fermi resonance FT-IR spectroscopic method.</p> <p>CO2:Understand the recapitulation of proton NMR spectroscopy, Factors affecting coupling</p>	<p>CO1:Learn the principles and theory behind UV and IR spectroscopy and the concept of molecular vibrations occurring due to absorption of IR radiation and electronic excitations due to absorption of UV radiations so that students will be able to identify the structures of unknown organic compounds. They can identify the functional groups in organic compounds like alcohol, aldehyde, ketone, ester, aromatic compounds etc. They will learn overtones, combination bands and Fermi resonance FT-IR spectroscopic method.</p> <p>CO2:Understand the recapitulation of proton NMR spectroscopy, Factors affecting coupling constants.</p>

				<p>constants. Also learn how to analyse the first order spectra, simplification of complex spectra, complex spin-spin splitting of second order spectra. They will learn the effect of deuteration and spectra of Homotopic, Enantiotopic and Diastereotopic systems. Also adopt the knowledge of Advanced NMR technique and about Fourier transform technique, Nuclear overhauser effect (NOE), COSEY, NOSEY and resonance of F19 and P31 nuclei.</p> <p>CO3: Learn the ion production - EI, CI, FD and FAB and factors affecting fragmentation analysis. Also understand the mass spectral fragmentation of different functional groups like aldehydes, ketones, esters, alcohols etc. so that they will be able to solve the problems on mass spectroscopy.</p> <p>CO4: Understand the concept of C13 NMR spectroscopy – chemical shift values of alkanes, alkenes, alkynes, aromatic compounds, carbonyl and heterocyclic compounds. Also learn this advanced C13 technique – NOE, DEPT, HETCOR and heteronuclear coupling. They will become confident to solve the problems on C13 NMR.</p>	<p>constants. Also learn how to analyse the first order spectra, simplification of complex spectra, complex spin-spin splitting of second order spectra. They will learn the effect of deuteration and spectra of Homotopic, Enantiotopic and Diastereotopic systems. Also adopt the knowledge of Advanced NMR technique and about Fourier transform technique, Nuclear overhauser effect (NOE), COSEY, NOSEY and resonance of F19 and P31 nuclei.</p> <p>CO3: Learn the ion production - EI, CI, FD and FAB and factors affecting fragmentation analysis. Also understand the mass spectral fragmentation of different functional groups like aldehydes, ketones, esters, alcohols etc. so that they will be able to solve the problems on mass spectroscopy.</p> <p>CO4: Understand the concept of C13 NMR spectroscopy – chemical shift values of alkanes, alkenes, alkynes, aromatic compounds, carbonyl and heterocyclic compounds. Also learn this advanced C13 technique – NOE, DEPT, HETCOR and heteronuclear coupling. They will become confident to solve the problems on C13 NMR.</p>	<p>Also learn how to analyse the first order spectra, simplification of complex spectra, complex spin-spin splitting of second order spectra. They will learn the effect of deuteration and spectra of Homotopic, Enantiotopic and Diastereotopic systems. Also adopt the knowledge of Advanced NMR technique and about Fourier transform technique, Nuclear overhauser effect (NOE), COSEY, NOSEY and resonance of F19 and P31 nuclei.</p> <p>CO3: Learn the ion production - EI, CI, FD and FAB and factors affecting fragmentation analysis. Also understand the mass spectral fragmentation of different functional groups like aldehydes, ketones, esters, alcohols etc. so that they will be able to solve the problems on mass spectroscopy.</p> <p>CO4: Understand the concept of C13 NMR spectroscopy – chemical shift values of alkanes, alkenes, alkynes, aromatic compounds, carbonyl and heterocyclic compounds. Also learn this advanced C13 technique – NOE, DEPT, HETCOR and heteronuclear coupling. They will become confident to solve the problems on C13 NMR.</p>
11	CC-1145C	Advanced Synthetic Methods	2019-20	<p>CO1: Understand the concept of disconnection approach through the introduction of synthons, synthetic equivalents and functional group interconversions. Also understand 1,2; 1,3; 1,4; 1,5 difunctional compounds, retrosynthesis of alkene, alkyne, alcohol, amines ...etc. Importance of the order of reaction in organic synthesis, the meaning of the terms – Chemoselectivity, Regioselectivity, protecting groups. They will learn Diel's Alder reaction, Michael addition, Robinson annulation and what is mean by reversal of polarity i.e. Umpolung reaction.</p> <p>CO2: Study the applications of different reagents like LDA, DCC, TBTH, lead tetra-acetate, etc. in chemical reactions like Woodward – Prevost hydroxylation, Barton and Shapiro reaction as well as applications of Periodic acid in Grub's catalysis.</p> <p>CO3: Learn how the different metals like Pd, Mg, Rh, Tl, Si and Cu in Click chemistry.</p> <p>CO4: Learn the new concept of supramolecular chemistry, advanced synthetic methods by using microwave oven, ultrasound waves, using the enzymes, electro-organic synthesis, use of</p>	<p>CO1: Understand the concept of disconnection approach through the introduction of synthons, synthetic equivalents and functional group interconversions. Also understand 1,2; 1,3; 1,4; 1,5 difunctional compounds, retrosynthesis of alkene, alkyne, alcohol, amines ...etc. Importance of the order of reaction in organic synthesis, the meaning of the terms – Chemoselectivity, Regioselectivity, protecting groups. They will learn Diel's Alder reaction, Michael addition, Robinson annulation and what is mean by reversal of polarity i.e. Umpolung reaction.</p> <p>CO2: Study the applications of different reagents like LDA, DCC, TBTH, lead tetra-acetate, etc. in chemical reactions like Woodward – Prevost hydroxylation, Barton and Shapiro reaction as well as applications of Periodic acid in Grub's catalysis.</p> <p>CO3: Learn how the different metals like Pd, Mg, Rh, Tl, Si and Cu in Click chemistry.</p> <p>CO4: Learn the new concept of supramolecular chemistry, advanced synthetic methods by using microwave oven, ultrasound waves, using the enzymes, electro-organic synthesis, use of</p>	<p>CO1: Understand the concept of disconnection approach through the introduction of synthons, synthetic equivalents and functional group interconversions. Also understand 1,2; 1,3; 1,4; 1,5 difunctional compounds, retrosynthesis of alkene, alkyne, alcohol, amines ...etc. Importance of the order of reaction in organic synthesis, the meaning of the terms – Chemoselectivity, Regioselectivity, protecting groups. They will learn Diel's Alder reaction, Michael addition, Robinson annulation and what is mean by reversal of polarity i.e. Umpolung reaction.</p> <p>CO2: Study the applications of different reagents like LDA, DCC, TBTH, lead tetra-acetate, etc. in chemical reactions like Woodward – Prevost hydroxylation, Barton and Shapiro reaction as well as applications of Periodic acid in Grub's catalysis.</p> <p>CO3: Learn how the different metals like Pd, Mg, Rh, Tl, Si and Cu in Click chemistry.</p> <p>CO4: Learn the new concept of supramolecular chemistry, advanced synthetic methods by using microwave oven, ultrasound waves, using the enzymes, electro-organic synthesis, use of</p>

				multicomponent reactions as well as the use of Ionic liquids in chemical reactions.	multicomponent reactions as well as the use of Ionic liquids in chemical reactions.	multicomponent reactions as well as the use of Ionic liquids in chemical reactions.
12	CC-1146C	Drugs and Heterocycles	2019-20	<p>CO1: a) Develop the new drugs, procedures followed in drug design, History and development quantitative structure activity relationship (QSAR). Also learn the concept of drug receptors and relationship between structure and chemical reactivity. b) Learn about Antibiotics like beta-lactam, cephalosporin and SAR of both and understand the structural features of tetracycline & macrocyclic antibiotics.</p> <p>CO2: Study the different types of drugs like Antimalarials, Anti-inflammatory, (e.g. Diclophenac), Anaesthetics, (e.g. lidocaine and thiopental), Antitubercular (Dapsone), Tranquilizers (Diazepam) etc. Also they can study about cardiovascular and Antineoplastic drugs.</p> <p>CO3: a) Understand synthesis and reactions of five membered heterocycles – Furan, benzofuran, pyrrole, thiophene, and benzothiophene etc. b) Learn the synthesis and reactions of six membered heterocycles like Pyridine, Quinoline and Coumarine.</p> <p>CO4: a) Learn the synthesis and reactions of diazines and triazines. (six membered heterocycles). b) Synthesis the reactions of azepines, oxepines & thiepinines. (seven membered heterocycles)</p>	<p>CO1: a) Develop the new drugs, procedures followed in drug design, History and development quantitative structure activity relationship (QSAR). Also learn the concept of drug receptors and relationship between structure and chemical reactivity. b) Learn about Antibiotics like beta-lactam, cephalosporin and SAR of both and understand the structural features of tetracycline & macrocyclic antibiotics.</p> <p>CO2: Study the different types of drugs like Antimalarials, Anti-inflammatory, (e.g. Diclophenac), Anaesthetics, (e.g. lidocaine and thiopental), Antitubercular (Dapsone), Tranquilizers (Diazepam) etc. Also they can study about cardiovascular and Antineoplastic drugs.</p> <p>CO3: a) Understand synthesis and reactions of five membered heterocycles – Furan, benzofuran, pyrrole, thiophene, and benzothiophene etc. b) Learn the synthesis and reactions of six membered heterocycles like Pyridine, Quinoline and Coumarine.</p> <p>CO4: a) Learn the synthesis and reactions of diazines and triazines. (six membered heterocycles). b) Synthesis the reactions of azepines, oxepines & thiepinines. (seven membered heterocycles)</p>	<p>CO1: a) Develop the new drugs, procedures followed in drug design, History and development quantitative structure activity relationship (QSAR). Also learn the concept of drug receptors and relationship between structure and chemical reactivity. b) Learn about Antibiotics like beta-lactam, cephalosporin and SAR of both and understand the structural features of tetracycline & macrocyclic antibiotics.</p> <p>CO2: Study the different types of drugs like Antimalarials, Anti-inflammatory, (e.g. Diclophenac), Anaesthetics, (e.g. lidocaine and thiopental), Antitubercular (Dapsone), Tranquilizers (Diazepam) etc. Also they can study about cardiovascular and Antineoplastic drugs.</p> <p>CO3: a) Understand synthesis and reactions of five membered heterocycles – Furan, benzofuran, pyrrole, thiophene, and benzothiophene etc. b) Learn the synthesis and reactions of six membered heterocycles like Pyridine, Quinoline and Coumarine.</p> <p>CO4: a) Learn the synthesis and reactions of diazines and triazines. (six membered heterocycles). b) Synthesis the reactions of azepines, oxepines & thiepinines. (seven membered heterocycles)</p>
13	CC-1149D	Theoretical Organic Chemistry	2019-20	<p>CO1: Understand the concept of aromaticity in benzenoids, Huckel's rule, energy level of p-molecular orbital, calculation of energies of cyclic and acyclic systems, different concepts of Huckel's as well as calculation of charge densities – PMO theory and reactivity index.</p> <p>CO2: a) Learn synthesis and reactions of polycyclic aromatic compounds - Linear and Non linear polynuclear hydrocarbons. b) Understand the concept of aromaticity and anti-aromaticity, the knowledge about 3- and 5- membered carbocyclic compounds, crown ethers complexes, cyclodextrins, catenanes and rotaxanes.</p> <p>CO3: Understand the types of free radicals, their detection by ESR, free radical substitution reaction mechanism, and reactivity at an aromatic substrate, reactivity at a bridgehead and reactivity in</p>	<p>CO1: Understand the concept of aromaticity in benzenoids, Huckel's rule, energy level of p-molecular orbital, calculation of energies of cyclic and acyclic systems, different concepts of Huckel's as well as calculation of charge densities – PMO theory and reactivity index.</p> <p>CO2: a) Learn synthesis and reactions of polycyclic aromatic compounds - Linear and Non linear polynuclear hydrocarbons. b) Understand the concept of aromaticity and anti-aromaticity, the knowledge about 3- and 5- membered carbocyclic compounds, crown ethers complexes, cyclodextrins, catenanes and rotaxanes.</p> <p>CO3: Understand the types of free radicals, their detection by ESR, free radical substitution reaction mechanism, and reactivity at an aromatic substrate, reactivity at a bridgehead and reactivity in</p>	<p>CO1: Understand the concept of aromaticity in benzenoids, Huckel's rule, energy level of p-molecular orbital, calculation of energies of cyclic and acyclic systems, different concepts of Huckel's as well as calculation of charge densities – PMO theory and reactivity index.</p> <p>CO2: a) Learn synthesis and reactions of polycyclic aromatic compounds - Linear and Non linear polynuclear hydrocarbons. b) Understand the concept of aromaticity and anti-aromaticity, the knowledge about 3- and 5- membered carbocyclic compounds, crown ethers complexes, cyclodextrins, catenanes and rotaxanes.</p> <p>CO3: Understand the types of free radicals, their detection by ESR, free radical substitution reaction mechanism, and reactivity at an aromatic substrate, reactivity at a bridgehead and reactivity in attacking</p>

				<p>attacking reagent. They also learn the effect of solvent on reactivity, Sandmeyer's reaction, Hunsdiecker reaction.</p> <p>CO4:a) Learn about the Kinetic and thermodynamic control of reaction, they will get the knowledge about Nitration and sulphonation of naphthalene, about Wittig reaction, Enolization, F. C. reaction and Diel's Alder reaction. b) Understand Non-classical carbonation - Formation, stability, reactivity and synthetic applications.</p>	<p>attacking reagent. They also learn the effect of solvent on reactivity, Sandmeyer's reaction, Hunsdiecker reaction.</p> <p>CO4:a) Learn about the Kinetic and thermodynamic control of reaction, they will get the knowledge about Nitration and sulphonation of naphthalene, about Wittig reaction, Enolization, F. C. reaction and Diel's Alder reaction. b) Understand Non-classical carbonation - Formation, stability, reactivity and synthetic applications.</p>	<p>reagent. They also learn the effect of solvent on reactivity, Sandmeyer's reaction, Hunsdiecker reaction.</p> <p>CO4:a) Learn about the Kinetic and thermodynamic control of reaction, they will get the knowledge about Nitration and sulphonation of naphthalene, about Wittig reaction, Enolization, F. C. reaction and Diel's Alder reaction. b) Understand Non-classical carbonation - Formation, stability, reactivity and synthetic applications.</p>
14	CC-1150D	Stereochemistry	2019-20	<p>CO1:Adopt the knowledge of about stereoselective, stereospecific synthesis as well as chemoselective and regioselective reactions - enantioselective synthesis, reactions with hydride donor, catalytic hydrogenation via chiral hydrazones and oxazolines etc.</p> <p>CO2:Understand the stereochemistry of acyclic and alicyclic compounds. A) Understand in depth Stability and Reactivity of diastereoisomers – Curtin-Hammett principle B) Some aspects of stereochemistry of ring compounds C) The shapes of the rings other than six membered rings (5, 6 and 7 membered rings). Also they will learn the conformational effects in medium sized rings and the concept of I-strain.</p> <p>CO3:a) Knowledge about conformation and configuration fused bicyclic rings and bridged rings – Types, Nomenclature, stereochemical restrictions, and Bredt's rule. b) Understand O. R. D. and C. D. - Types of curves, circular dichroism, the Octane rule and axial haloketone rule.</p> <p>CO4:Explain the stereochemistry of Allenes, Spiranes, and Biphenyls and how to assign the configuration and by using physical and chemical methods.</p>	<p>CO1:Adopt the knowledge of about stereoselective, stereospecific synthesis as well as chemoselective and regioselective reactions - enantioselective synthesis, reactions with hydride donor, catalytic hydrogenation via chiral hydrazones and oxazolines etc.</p> <p>CO2:Understand the stereochemistry of acyclic and alicyclic compounds. A) Understand in depth Stability and Reactivity of diastereoisomers – Curtin-Hammett principle B) Some aspects of stereochemistry of ring compounds C) The shapes of the rings other than six membered rings (5, 6 and 7 membered rings). Also they will learn the conformational effects in medium sized rings and the concept of I-strain.</p> <p>CO3:a) Knowledge about conformation and configuration fused bicyclic rings and bridged rings – Types, Nomenclature, stereochemical restrictions, and Bredt's rule. b) Understand O. R. D. and C. D. - Types of curves, circular dichroism, the Octane rule and axial haloketone rule.</p> <p>CO4:Explain the stereochemistry of Allenes, Spiranes, and Biphenyls and how to assign the configuration and by using physical and chemical methods.</p>	<p>CO1:Adopt the knowledge of about stereoselective, stereospecific synthesis as well as chemoselective and regioselective reactions -enantioselective synthesis, reactions with hydride donor, catalytic hydrogenation via chiral hydrazones and oxazolines etc.</p> <p>CO2:Understand the stereochemistry of acyclic and alicyclic compounds. A) Understand in depth Stability and Reactivity of diastereoisomers – Curtin-Hammett principle B) Some aspects of stereochemistry of ring compounds C) The shapes of the rings other than six membered rings (5, 6 and 7 membered rings). Also they will learn the conformational effects in medium sized rings and the concept of I-strain.</p> <p>CO3:a) Knowledge about conformation and configuration fused bicyclic rings and bridged rings – Types, Nomenclature, stereochemical restrictions, and Bredt's rule. b) Understand O. R. D. and C. D. - Types of curves, circular dichroism, the Octane rule and axial haloketone rule.</p> <p>CO4:Explain the stereochemistry of Allenes, Spiranes, and Biphenyls and how to assign the configuration and by using physical and chemical methods.</p>
15	CC_1151D	Natural Products	2019-20	<p>CO1:a) Learn the classification and isolation methods of Natural Products. b) Reveal the classification and isolation methods of terpenoids – structure and synthesis of – Camphor, Carvone, Abietic acid, zingiberene, alpha-santonin and beta-caryophyllene.</p> <p>CO2:Know all about Alkaloids - the occurrence, isolation, structures, functions, stereochemistry and synthesis of the major Alkaloids like – Morphine, Reserpine, Atropine and Conin.</p>	<p>CO1:a) Learn the classification and isolation methods of Natural Products. b) Reveal the classification and isolation methods of terpenoids – structure and synthesis of – Camphor, Carvone, Abietic acid, zingiberene, alpha-santonin and beta-caryophyllene.</p> <p>CO2:Know all about Alkaloids - the occurrence, isolation, structures, functions, stereochemistry and synthesis of the major Alkaloids like – Morphine, Reserpine, Atropine and Conin.</p>	<p>CO1:a) Learn the classification and isolation methods of Natural Products. b) Reveal the classification and isolation methods of terpenoids – structure and synthesis of – Camphor, Carvone, Abietic acid, zingiberene, alpha-santonin and beta-caryophyllene.</p> <p>CO2:Know all about Alkaloids - the occurrence, isolation, structures, functions, stereochemistry and synthesis of the major Alkaloids like – Morphine, Reserpine, Atropine and Conin.</p>

				<p>CO3:a) Learn the occurrence, nomenclature, basic skeleton of steroids and study the synthesis of hormones like cholesterol, Androsterone, Testosterone, Estrone etc. b) Study the nomenclature, classification, biogenesis, physiological effects and synthesis of prostaglandin PGE2 and PGF2.</p> <p>CO4:Study about the Vitamins - Classification, Nomenclature, Source, effects due to deficiency, synthesis and biological functions of vitamin B1, B2, B5, B6 and Biotin i.e. vitamin H.</p>	<p>CO3:a) Learn the occurrence, nomenclature, basic skeleton of steroids and study the synthesis of hormones like cholesterol, Androsterone, Testosterone, Estrone etc. b) Study the nomenclature, classification, biogenesis, physiological effects and synthesis of prostaglandin PGE2 and PGF2.</p> <p>CO4:Study about the Vitamins - Classification, Nomenclature, Source, effects due to deficiency, synthesis and biological functions of vitamin B1, B2, B5, B6 and Biotin i.e. vitamin H.</p>	<p>CO3:a) Learn the occurrence, nomenclature, basic skeleton of steroids and study the synthesis of hormones like cholesterol, Androsterone, Testosterone, Estrone etc. b) Study the nomenclature, classification, biogenesis, physiological effects and synthesis of prostaglandin PGE2 and PGF2.</p> <p>CO4:Study about the Vitamins - Classification, Nomenclature, Source, effects due to deficiency, synthesis and biological functions of vitamin B1, B2, B5, B6 and Biotin i.e. vitamin H.</p>
16	CC – 1152 D	Applied organic Chemistry	2019-20	<p>CO1:Learn about the synthesis and uses of different types of Agrochemicals – Carbamates (carbaryl, Aldicarb, Ziram and Zineb), Organophosphorous insecticides (malathion, monocrotophos, mevinphos etc.), Natural and Synthetic Pyrethroids - structures classification and their synthesis. They will learn synthesis of some plant growth regulators as well as synthesis and applications of Juvenile hormones and Pheromones (bombykol, grandisol and disparlure).</p> <p>CO2:Learn about the perfumery compounds – commercial process, preparation and importance of essential oils, synthesis of 2 - phenyl ethanol, yara-yara, vanillin, synthetic musk, jasmine, ionone etc. from citral, phenyl acetate ester, benzyl acetate ester.</p> <p>CO3:Understand classification, synthesis of azo dyes, reactive dyes, optical brightners, dispersed dyes etc. by nitration, sulphonation and diazotization reactions.</p> <p>CO4:Understand about Polymers: the mechanism of polymerization with some examples – polyesters, polyamide, PVC, etc. Also they will study about manufacturing processes of synthetic rubber like butadiene - styrene, formaldehyde resin, about plasticizers, anti-oxidants required for natural polymers like starch and cellulose. They will get the knowledge about Oxo and Wacker process necessary for Soap and Synthetic detergents.</p>	<p>CO1:Learn about the synthesis and uses of different types of Agrochemicals – Carbamates (carbaryl, Aldicarb, Ziram and Zineb), Organophosphorous insecticides (malathion, monocrotophos, mevinphos etc.), Natural and Synthetic Pyrethroids - structures classification and their synthesis. They will learn synthesis of some plant growth regulators as well as synthesis and applications of Juvenile hormones and Pheromones (bombykol, grandisol and disparlure).</p> <p>CO2:Learn about the perfumery compounds – commercial process, preparation and importance of essential oils, synthesis of 2 - phenyl ethanol, yara-yara, vanillin, synthetic musk, jasmine, ionone etc. from citral, phenyl acetate ester, benzyl acetate ester.</p> <p>CO3:Understand classification, synthesis of azo dyes, reactive dyes, optical brightners, dispersed dyes etc. by nitration, sulphonation and diazotization reactions.</p> <p>CO4:Understand about Polymers: the mechanism of polymerization with some examples – polyesters, polyamide, PVC, etc. Also they will study about manufacturing processes of synthetic rubber like butadiene - styrene, formaldehyde resin, about plasticizers, anti-oxidants required for natural polymers like starch and cellulose. They will get the knowledge about Oxo and Wacker process necessary for Soap and Synthetic detergents.</p>	<p>CO1:Learn about the synthesis and uses of different types of Agrochemicals – Carbamates (carbaryl, Aldicarb, Ziram and Zineb), Organophosphorous insecticides (malathion, monocrotophos, mevinphos etc.), Natural and Synthetic Pyrethroids - structures classification and their synthesis. They will learn synthesis of some plant growth regulators as well as synthesis and applications of Juvenile hormones and Pheromones (bombykol, grandisol and disparlure).</p> <p>CO2:Learn about the perfumery compounds – commercial process, preparation and importance of essential oils, synthesis of 2 - phenyl ethanol, yara-yara, vanillin, synthetic musk, jasmine, ionone etc. from citral, phenyl acetate ester, benzyl acetate ester.</p> <p>CO3:Understand classification, synthesis of azo dyes, reactive dyes, optical brightners, dispersed dyes etc. by nitration, sulphonation and diazotization reactions.</p> <p>CO4:Understand about Polymers: the mechanism of polymerization with some examples – polyesters, polyamide, PVC, etc. Also they will study about manufacturing processes of synthetic rubber like butadiene - styrene, formaldehyde resin, about plasticizers, anti-oxidants required for natural polymers like starch and cellulose. They will get the knowledge about Oxo and Wacker process necessary for Soap and Synthetic detergents.</p>
17	CC_2100 C	Inorganic Chemical Spectroscopy	2022-23	<p>CO1:Interpret the symmetry elements and their operations as required to specify molecular symmetry and possible point groups from symmetry elements and be able to find point group of molecules by systematic procedure.</p>	<p>CO1:Interpret the symmetry elements and their operations as required to specify molecular symmetry and possible point groups from symmetry elements and be able to find point group of molecules by systematic procedure.</p>	<p>CO1:Interpret the symmetry elements and their operations as required to specify molecular symmetry and possible point groups from symmetry elements and be able to find point group of molecules by systematic procedure.</p>

				<p>CO2: Explain the principle and instrumentation of infra-red (IR) and Raman spectroscopy and interpret infrared and raman spectra for chemical analysis inorganic compounds.</p> <p>CO3: Explain the principle and instrumentation of Mass spectroscopy and interpret Mass spectrum for chemical analysis of inorganic compounds.</p> <p>CO4: Explain the principle and instrumentation of nuclear magnetic resonance (NMR) and X-ray photoelectron spectroscopy (XPS) and interpret the spectrum for chemical analysis of inorganic compounds.</p>	<p>CO2: Explain the principle and instrumentation of infra-red (IR) and Raman spectroscopy and interpret infrared and raman spectra for chemical analysis inorganic compounds.</p> <p>CO3: Explain the principle and instrumentation of Mass spectroscopy and interpret Mass spectrum for chemical analysis of inorganic compounds.</p> <p>CO4: Explain the principle and instrumentation of nuclear magnetic resonance (NMR) and X-ray photoelectron spectroscopy (XPS) and interpret the spectrum for chemical analysis of inorganic compounds.</p>	<p>CO2: Explain the principle and instrumentation of infra-red (IR) and Raman spectroscopy and interpret infrared and raman spectra for chemical analysis inorganic compounds.</p> <p>CO3: Explain the principle and instrumentation of Mass spectroscopy and interpret Mass spectrum for chemical analysis of inorganic compounds.</p> <p>CO4: Explain the principle and instrumentation of nuclear magnetic resonance (NMR) and X-ray photoelectron spectroscopy (XPS) and interpret the spectrum for chemical analysis of inorganic compounds.</p>
18	CC_2101 C	Organometallic and Bioinorganic Chemistry	2022-23	<p>CO1: Explain methods of properties, preparation, stability and applications of organometallic compounds in organic synthesis.</p> <p>CO2: Interpret structure and bonding transition metal pi-complexes and their applications in organic synthesis relating to nucleophilic and electrophilic attack on ligands.</p> <p>CO3: Get a basic understanding of medicinal use of metal complexes as antibacterial, antiviral, antibiotics and related compounds.</p> <p>CO4: Understand transport and storage of dioxygen through different carriers, study electron transfer in Biology involving metalloproteins and cytochromes and role of metals in medicine.</p>	<p>CO1: Explain methods of properties, preparation, stability and applications of organometallic compounds in organic synthesis.</p> <p>CO2: Interpret structure and bonding transition metal pi-complexes and their applications in organic synthesis relating to nucleophilic and electrophilic attack on ligands.</p> <p>CO3: Get a basic understanding of medicinal use of metal complexes as antibacterial, antiviral, antibiotics and related compounds.</p> <p>CO4: Understand transport and storage of dioxygen through different carriers, study electron transfer in Biology involving metalloproteins and cytochromes and role of metals in medicine.</p>	<p>CO1: Explain methods of properties, preparation, stability and applications of organometallic compounds in organic synthesis.</p> <p>CO2: Interpret structure and bonding transition metal pi-complexes and their applications in organic synthesis relating to nucleophilic and electrophilic attack on ligands.</p> <p>CO3: Get a basic understanding of medicinal use of metal complexes as antibacterial, antiviral, antibiotics and related compounds.</p> <p>CO4: Understand transport and storage of dioxygen through different carriers, study electron transfer in Biology involving metalloproteins and cytochromes and role of metals in medicine.</p>
19	CC_2102 C	Coordination Chemistry - I	2022-23	<p>CO1: Know the fundamentals in photochemistry and explain different types of photochemical reactions and photochemistry of coordination compounds.</p> <p>CO2: Explain non-chelate forming and chelate forming reactions.</p> <p>CO3: Understand magnetic properties of complexes and explain w. r. t. spin orbit coupling.</p> <p>CO4: Understand and explain mixed ligand complexes and use of transition metal complexes in catalysis.</p>	<p>CO1: Know the fundamentals in photochemistry and explain different types of photochemical reactions and photochemistry of coordination compounds.</p> <p>CO2: Explain non-chelate forming and chelate forming reactions.</p> <p>CO3: Understand magnetic properties of complexes and explain w. r. t. spin orbit coupling.</p> <p>CO4: Understand and explain mixed ligand complexes and use of transition metal complexes in catalysis.</p>	<p>CO1: Know the fundamentals in photochemistry and explain different types of photochemical reactions and photochemistry of coordination compounds.</p> <p>CO2: Explain non-chelate forming and chelate forming reactions.</p> <p>CO3: Understand magnetic properties of complexes and explain w. r. t. spin orbit coupling.</p> <p>CO4: Understand and explain mixed ligand complexes and use of transition metal complexes in catalysis.</p>
20	CC_2103 C	Material Science	2022-23	<p>CO1: Explain mechanism of superconductors, classify super conductors, and explain BCS theory of superconductivity and know the applications of different materials.</p> <p>CO2: Explain magnetic materials and their applications in different fields.</p> <p>CO3: Explore new areas of research in both ceramics and composite materials manufacturing.</p>	<p>CO1: Explain mechanism of superconductors, classify super conductors, and explain BCS theory of superconductivity and know the applications of different materials.</p> <p>CO2: Explain magnetic materials and their applications in different fields.</p> <p>CO3: Explore new areas of research in both ceramics and composite materials manufacturing.</p>	<p>CO1: Explain mechanism of superconductors, classify super conductors, and explain BCS theory of superconductivity and know the applications of different materials.</p> <p>CO2: Explain magnetic materials and their applications in different fields.</p> <p>CO3: Explore new areas of research in both ceramics and composite materials manufacturing.</p>

				CO4: Understand and apply core principles and concepts in catalysis using different inorganic complexes as catalyst.	CO4: Understand and apply core principles and concepts in catalysis using different inorganic complexes as catalyst.	CO4: Understand and apply core principles and concepts in catalysis using different inorganic complexes as catalyst.
21	CC_2106 D	Instrumental Techniques	2022-23	<p>CO1:Understand and use various crystallographic databases. Process data, solve and interpret a single crystal structure. Apply the concepts of unit cells and lattices to describe observed diffraction patterns in reciprocal space.</p> <p>CO2:Acquire knowledge of Nuclear Quadrupole Resonance and X-ray fluorescence Spectroscopy and apply to interpret data.</p> <p>CO3:Understand the principal, instrumentation and apply for structural elucidation and investigation of compounds.</p> <p>CO4:Understand ESR measurements, acquire information about the existence of unpaired electrons, as well as quantities, type, nature, environment and behaviour and to interpret structure.</p>	<p>CO1:Understand and use various crystallographic databases. Process data, solve and interpret a single crystal structure. Apply the concepts of unit cells and lattices to describe observed diffraction patterns in reciprocal space.</p> <p>CO2:Acquire knowledge of Nuclear Quadrupole Resonance and X-ray fluorescence Spectroscopy and apply to interpret data.</p> <p>CO3:Understand the principal, instrumentation and apply for structural elucidation and investigation of compounds.</p> <p>CO4:Understand ESR measurements, acquire information about the existence of unpaired electrons, as well as quantities, type, nature, environment and behaviour and to interpret structure.</p>	<p>CO1:Understand and use various crystallographic databases. Process data, solve and interpret a single crystal structure. Apply the concepts of unit cells and lattices to describe observed diffraction patterns in reciprocal space.</p> <p>CO2:Acquire knowledge of Nuclear Quadrupole Resonance and X-ray fluorescence Spectroscopy and apply to interpret data.</p> <p>CO3:Understand the principal, instrumentation and apply for structural elucidation and investigation of compounds.</p> <p>CO4:Understand ESR measurements, acquire information about the existence of unpaired electrons, as well as quantities, type, nature, environment and behaviour and to interpret structure.</p>
22	CC_2107 D	Coordination Chemistry-II	2022-23	<p>CO1:Explain lability and inertness of complexes and with respect to VBT and CFT.</p> <p>CO2:Explain the kinetics and mechanism of substitution and electron transfer reactions in octahedral and square planar complexes.</p> <p>CO3:Understand the classification of coordination polymers and learn the chemical background of individual polymers.</p> <p>CO4:Know the applications of coordination compounds in industrial processes.</p>	<p>CO1:Explain lability and inertness of complexes and with respect to VBT and CFT.</p> <p>CO2:Explain the kinetics and mechanism of substitution and electron transfer reactions in octahedral and square planar complexes.</p> <p>CO3:Understand the classification of coordination polymers and learn the chemical background of individual polymers.</p> <p>CO4:Know the applications of coordination compounds in industrial processes.</p>	<p>CO1:Explain lability and inertness of complexes and with respect to VBT and CFT.</p> <p>CO2:Explain the kinetics and mechanism of substitution and electron transfer reactions in octahedral and square planar complexes.</p> <p>CO3:Understand the classification of coordination polymers and learn the chemical background of individual polymers.</p> <p>CO4:Know the applications of coordination compounds in industrial processes.</p>
23	CC_2108 D	Energy and Environmental Chemistry	2022-23	<p>CO1:Understand the basic building blocks of various forms of energy and to know applications of fuel cells in various sectors, hydrogen production, storage, handling and safety issues.</p> <p>CO2:Understand energy storage systems and describe the parts in various Li-Ion Battery, materials and functionalities.</p> <p>CO3:Explain the common principles, routes and processes in controlling the gaseous pollutants.</p> <p>CO4:Understand meaning of important parameters for measuring water quality and understand the principles and the practical approaches and technique required to effectively monitor the chemical, hydrological and microbiological elements of water quality.</p>	<p>CO1:Understand the basic building blocks of various forms of energy and to know applications of fuel cells in various sectors, hydrogen production, storage, handling and safety issues.</p> <p>CO2:Understand energy storage systems and describe the parts in various Li-Ion Battery, materials and functionalities.</p> <p>CO3:Explain the common principles, routes and processes in controlling the gaseous pollutants.</p> <p>CO4:Understand meaning of important parameters for measuring water quality and understand the principles and the practical approaches and technique required to effectively monitor the chemical, hydrological and microbiological elements of water quality.</p>	<p>CO1:Understand the basic building blocks of various forms of energy and to know applications of fuel cells in various sectors, hydrogen production, storage, handling and safety issues.</p> <p>CO2:Understand energy storage systems and describe the parts in various Li-Ion Battery, materials and functionalities.</p> <p>CO3:Explain the common principles, routes and processes in controlling the gaseous pollutants.</p> <p>CO4:Understand meaning of important parameters for measuring water quality and understand the principles and the practical approaches and technique required to effectively monitor the chemical, hydrological and microbiological elements of water quality.</p>

24	CC_2109D	Inorganic Nanomaterials	2022-23	<p>CO1:Understand synthesis approaches of nanomaterials and challenges in Nano Technology.</p> <p>CO2:Describe different characterization techniques of materials, outline the principles on which they are based, and explain their limitations.</p> <p>CO3:Understand the technological application of nanomaterial is usable in multiple sectors, from healthcare and mechanics to environmental preservation and air purification.</p> <p>CO4:Acquire knowledge about the toxicity in Nanoscience, and their effects on Human as well as learn various concepts of toxicity, and its effects.</p>	<p>CO1:Understand synthesis approaches of nanomaterials and challenges in Nano Technology.</p> <p>CO2:Describe different characterization techniques of materials, outline the principles on which they are based, and explain their limitations.</p> <p>CO3:Understand the technological application of nanomaterial is usable in multiple sectors, from healthcare and mechanics to environmental preservation and air purification.</p> <p>CO4:Acquire knowledge about the toxicity in Nanoscience, and their effects on Human as well as learn various concepts of toxicity, and its effects.</p>	<p>CO1:Understand synthesis approaches of nanomaterials and challenges in Nano Technology.</p> <p>CO2:Describe different characterization techniques of materials, outline the principles on which they are based, and explain their limitations.</p> <p>CO3:Understand the technological application of nanomaterial is usable in multiple sectors, from healthcare and mechanics to environmental preservation and air purification.</p> <p>CO4:Acquire knowledge about the toxicity in Nanoscience, and their effects on Human as well as learn various concepts of toxicity, and its effects.</p>
25	CC-2200C	Advanced Analytical Techniques	2023-24	<p>CO1:Learn mass spectrometry by outlining its principles, historical context, compound-based classification, ionization techniques, and diverse mass analyser comparisons.</p> <p>CO2:Understand the importance of nanomaterials and nanotechnology, distinguish between diverse nanomaterial dimensions, elucidate synthesis methods with examples, and evaluate application areas across fields.</p> <p>CO3:Attain expertise in advanced microscopy techniques by comprehending working principles, recognizing practical applications, and distinguishing between methods based on strengths and limitations.</p> <p>CO4:Gain comprehensive proficiency in a spectrum of spectroscopic techniques, encompassing principles, instrumentation, data analysis and practical applications.</p>	<p>CO1:Learn mass spectrometry by outlining its principles, historical context, compound-based classification, ionization techniques, and diverse mass analyser comparisons.</p> <p>CO2:Understand the importance of nanomaterials and nanotechnology, distinguish between diverse nanomaterial dimensions, elucidate synthesis methods with examples, and evaluate application areas across fields.</p> <p>CO3:Attain expertise in advanced microscopy techniques by comprehending working principles, recognizing practical applications, and distinguishing between methods based on strengths and limitations.</p> <p>CO4:Gain comprehensive proficiency in a spectrum of spectroscopic techniques, encompassing principles, instrumentation, data analysis and practical applications.</p>	<p>CO1:Learn mass spectrometry by outlining its principles, historical context, compound-based classification, ionization techniques, and diverse mass analyser comparisons.</p> <p>CO2:Understand the importance of nanomaterials and nanotechnology, distinguish between diverse nanomaterial dimensions, elucidate synthesis methods with examples, and evaluate application areas across fields.</p> <p>CO3:Attain expertise in advanced microscopy techniques by comprehending working principles, recognizing practical applications, and distinguishing between methods based on strengths and limitations.</p> <p>CO4:Gain comprehensive proficiency in a spectrum of spectroscopic techniques, encompassing principles, instrumentation, data analysis and practical applications.</p>
26	CC-2201C	Organo Analytical Chemistry	2023-24	<p>CO1:Develop a profound grasp of UV-Visible, IR, 1H-NMR, 13C NMR, and Mass Spectrometry, encompassing fundamental principles, advanced organic analysis, and the ability to solve intricate structural determination challenges.</p> <p>CO2:Proficiently classify drugs, pinpoint potential impurity sources in pharmaceutical raw materials, execute limit tests for Pb, As, Fe, and utilize a range of analytical techniques, including UV, colorimetric, and biological assays, for the comprehensive analysis of drugs and vitamins.</p> <p>CO3:Gain a comprehensive knowledge of clinical analysis and enzyme assay techniques, showcase adeptness in collecting, preserving, and analysing physiological fluids, conduct estimations of key constituents in blood and urine samples, and</p>	<p>CO1:Develop a profound grasp of UV-Visible, IR, 1H-NMR, 13C NMR, and Mass Spectrometry, encompassing fundamental principles, advanced organic analysis, and the ability to solve intricate structural determination challenges.</p> <p>CO2:Proficiently classify drugs, pinpoint potential impurity sources in pharmaceutical raw materials, execute limit tests for Pb, As, Fe, and utilize a range of analytical techniques, including UV, colorimetric, and biological assays, for the comprehensive analysis of drugs and vitamins.</p> <p>CO3:Gain a comprehensive knowledge of clinical analysis and enzyme assay techniques, showcase adeptness in collecting, preserving, and analysing physiological fluids, conduct estimations of key constituents in blood and urine samples, and</p>	<p>CO1:Develop a profound grasp of UV-Visible, IR, 1H-NMR, 13C NMR, and Mass Spectrometry, encompassing fundamental principles, advanced organic analysis, and the ability to solve intricate structural determination challenges.</p> <p>CO2:Proficiently classify drugs, pinpoint potential impurity sources in pharmaceutical raw materials, execute limit tests for Pb, As, Fe, and utilize a range of analytical techniques, including UV, colorimetric, and biological assays, for the comprehensive analysis of drugs and vitamins.</p> <p>CO3:Gain a comprehensive knowledge of clinical analysis and enzyme assay techniques, showcase adeptness in collecting, preserving, and analysing physiological fluids, conduct estimations of key constituents in blood and urine samples, and</p>

				effectively employ analytical methods for diagnosing diseases. CO4: Engage in a comprehensive exploration of pesticide introduction, classification, and analysis, utilizing colorimetric and chromatographic techniques like GC-MS, HPLC-MS to examine pesticide residues, and the estimation of toxic substances such as lead, mercury, arsenic in biological samples for forensic applications.	effectively employ analytical methods for diagnosing diseases. CO4: Engage in a comprehensive exploration of pesticide introduction, classification, and analysis, utilizing colorimetric and chromatographic techniques like GC-MS, HPLC-MS to examine pesticide residues, and the estimation of toxic substances such as lead, mercury, arsenic in biological samples for forensic applications.	effectively employ analytical methods for diagnosing diseases. CO4: Engage in a comprehensive exploration of pesticide introduction, classification, and analysis, utilizing colorimetric and chromatographic techniques like GC-MS, HPLC-MS to examine pesticide residues, and the estimation of toxic substances such as lead, mercury, arsenic in biological samples for forensic applications.
27	CC-2202C	Electroanalytical Techniques in Chemical Analysis	2023-24	CO1: Develop a comprehensive comprehension of voltammetry principles, encompassing cyclic voltammetry, pulse voltammetry, and stripping voltammetry, for analyte determination and showcasing their real-world applications in analytical chemistry and research. CO2: Understand the classification, properties, theories of charge origin, stability, factors influencing coagulation and spontaneous ageing of colloids, as well as differentiate types of emulsions, elucidating their preparation, properties, and demulsification methods. CO3: Attain a thorough understanding of particle size analysis methodologies such as LASER light scattering, dynamic light scattering, and photosedimentation, including theoretical models like Mie theory and Fraunhofer diffraction theory and to apply diverse techniques like XRD, SEM, and TEM for real-world particle size measurements. CO4: Explain different ion-selective electrode types, encompassing glass, solid-state, liquid-liquid membrane, enzyme, and gas electrodes, detailing their construction and applications.	CO1: Develop a comprehensive comprehension of voltammetry principles, encompassing cyclic voltammetry, pulse voltammetry, and stripping voltammetry, for analyte determination and showcasing their real-world applications in analytical chemistry and research. CO2: Understand the classification, properties, theories of charge origin, stability, factors influencing coagulation and spontaneous ageing of colloids, as well as differentiate types of emulsions, elucidating their preparation, properties, and demulsification methods. CO3: Attain a thorough understanding of particle size analysis methodologies such as LASER light scattering, dynamic light scattering, and photosedimentation, including theoretical models like Mie theory and Fraunhofer diffraction theory and to apply diverse techniques like XRD, SEM, and TEM for real-world particle size measurements. CO4: Explain different ion-selective electrode types, encompassing glass, solid-state, liquid-liquid membrane, enzyme, and gas electrodes, detailing their construction and applications.	CO1: Develop a comprehensive comprehension of voltammetry principles, encompassing cyclic voltammetry, pulse voltammetry, and stripping voltammetry, for analyte determination and showcasing their real-world applications in analytical chemistry and research. CO2: Understand the classification, properties, theories of charge origin, stability, factors influencing coagulation and spontaneous ageing of colloids, as well as differentiate types of emulsions, elucidating their preparation, properties, and demulsification methods. CO3: Attain a thorough understanding of particle size analysis methodologies such as LASER light scattering, dynamic light scattering, and photosedimentation, including theoretical models like Mie theory and Fraunhofer diffraction theory and to apply diverse techniques like XRD, SEM, and TEM for real-world particle size measurements. CO4: Explain different ion-selective electrode types, encompassing glass, solid-state, liquid-liquid membrane, enzyme, and gas electrodes, detailing their construction and applications.
28	CC-2203C	Environmental Chemical Analysis and Control	2023-24	CO1: Develop a comprehensive grasp of sampling theory, techniques, and criteria for gases, liquids, and solids; implement strategies to minimize variables during sampling and ensure efficient transmission and storage of collected samples. CO2: Acquire expertise in performing comprehensive environmental analyses through a range of electrochemical techniques, including conductometry, potentiometry, cyclic voltammetry, amperometry, and coulometry, fluorescence spectrometry, inductively coupled plasma spectrometry, turbidimetry, and non-	CO1: Develop a comprehensive grasp of sampling theory, techniques, and criteria for gases, liquids, and solids; implement strategies to minimize variables during sampling and ensure efficient transmission and storage of collected samples. CO2: Acquire expertise in performing comprehensive environmental analyses through a range of electrochemical techniques, including conductometry, potentiometry, cyclic voltammetry, amperometry, and coulometry, fluorescence spectrometry, inductively coupled plasma spectrometry, turbidimetry, and non-	CO1: Develop a comprehensive grasp of sampling theory, techniques, and criteria for gases, liquids, and solids; implement strategies to minimize variables during sampling and ensure efficient transmission and storage of collected samples. CO2: Acquire expertise in performing comprehensive environmental analyses through a range of electrochemical techniques, including conductometry, potentiometry, cyclic voltammetry, amperometry, and coulometry, fluorescence spectrometry, inductively coupled plasma spectrometry, turbidimetry, and non-dispersive

				<p>dispersive infrared analysis (NDIR) for diverse environmental applications.</p> <p>CO3:Develop a comprehensive understanding of the chemistry, sources, characterization, and analysis methods for air pollutants, major minor components in potable and industrial water, conducting measurements for parameters including DO, COD, and BOD; and perform in-depth analyses of pollutants such as Pd, Cd, Hg, Cr, As in water, including quality assessments of organic and inorganic constituents in industrial wastewater.</p> <p>CO4:Grasp the lifecycle of phenolic residues, including their sources, disposal, treatment, and analysis, with a focus on recovery methods from liquid effluents; adeptly conduct analysis of organomercurials, organochlorine pesticides, and volatile organic pollutants, employing suitable analytical methods.</p>	<p>dispersive infrared analysis (NDIR) for diverse environmental applications.</p> <p>CO3:Develop a comprehensive understanding of the chemistry, sources, characterization, and analysis methods for air pollutants, major minor components in potable and industrial water, conducting measurements for parameters including DO, COD, and BOD; and perform in-depth analyses of pollutants such as Pd, Cd, Hg, Cr, As in water, including quality assessments of organic and inorganic constituents in industrial wastewater.</p> <p>CO4:Grasp the lifecycle of phenolic residues, including their sources, disposal, treatment, and analysis, with a focus on recovery methods from liquid effluents; adeptly conduct analysis of organomercurials, organochlorine pesticides, and volatile organic pollutants, employing suitable analytical methods.</p>	<p>infrared analysis (NDIR) for diverse environmental applications.</p> <p>CO3:Develop a comprehensive understanding of the chemistry, sources, characterization, and analysis methods for air pollutants, major minor components in potable and industrial water, conducting measurements for parameters including DO, COD, and BOD; and perform in-depth analyses of pollutants such as Pd, Cd, Hg, Cr, As in water, including quality assessments of organic and inorganic constituents in industrial wastewater.</p> <p>CO4:Grasp the lifecycle of phenolic residues, including their sources, disposal, treatment, and analysis, with a focus on recovery methods from liquid effluents; adeptly conduct analysis of organomercurials, organochlorine pesticides, and volatile organic pollutants, employing suitable analytical methods.</p>
29	CC-2206D	Modern Separation Methods in Analysis	2023-24	<p>CO1:Understand the advanced gas and liquid chromatographic techniques. They will be well-versed in the principles, instrumentation, working mechanisms.</p> <p>CO2:Utilize hyphenated techniques, such as gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS), to enhance compound identification and quantification.</p> <p>CO3:Apply their knowledge to practical scenarios and research projects. They will possess the skills to select appropriate chromatographic techniques based on the characteristics of analytes, separation requirements, and analytical objectives.</p> <p>CO4:Grasp the modern extraction and separation techniques, including solid-phase extraction, solid-phase microextraction, sonic extraction, and accelerated solvent extraction.</p>	<p>CO1:Understand the advanced gas and liquid chromatographic techniques. They will be well-versed in the principles, instrumentation, working mechanisms.</p> <p>CO2:Utilize hyphenated techniques, such as gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS), to enhance compound identification and quantification.</p> <p>CO3:Apply their knowledge to practical scenarios and research projects. They will possess the skills to select appropriate chromatographic techniques based on the characteristics of analytes, separation requirements, and analytical objectives.</p> <p>CO4:Grasp the modern extraction and separation techniques, including solid-phase extraction, solid-phase microextraction, sonic extraction, and accelerated solvent extraction.</p>	<p>CO1:Understand the advanced gas and liquid chromatographic techniques. They will be well-versed in the principles, instrumentation, working mechanisms.</p> <p>CO2:Utilize hyphenated techniques, such as gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS), to enhance compound identification and quantification.</p> <p>CO3:Apply their knowledge to practical scenarios and research projects. They will possess the skills to select appropriate chromatographic techniques based on the characteristics of analytes, separation requirements, and analytical objectives.</p> <p>CO4:Grasp the modern extraction and separation techniques, including solid-phase extraction, solid-phase microextraction, sonic extraction, and accelerated solvent extraction.</p>
30	CC-2207D	Organic Industrial Analysis	2023-24	<p>CO1:Understand the various chemical analysis techniques used in the industrial context.</p> <p>CO2: Perform quality control analyses and ensure compliance with regulations in various industries. They will be capable of analyzing raw materials, additives, and finished products to assess their composition, purity, and adherence to industry standards.</p>	<p>CO1:Understand the various chemical analysis techniques used in the industrial context.</p> <p>CO2:Perform quality control analyses and ensure compliance with regulations in various industries. They will be capable of analyzing raw materials, additives, and finished products to assess their composition, purity, and adherence to industry standards.</p>	<p>CO1:Understand the various chemical analysis techniques used in the industrial context.</p> <p>CO2:Perform quality control analyses and ensure compliance with regulations in various industries. They will be capable of analyzing raw materials, additives, and finished products to assess their composition, purity, and adherence to industry standards.</p>

				<p>CO3:Understand the principles of various techniques such as chromatography, spectrophotometry, titration, and bomb calorimetry.</p> <p>CO4:Develop problem-solving skills to address issues related to contamination, adulteration, impurity identification, and quality assurance.</p>	<p>CO3:Understand the principles of various techniques such as chromatography, spectrophotometry, titration, and bomb calorimetry.</p> <p>CO4:Develop problem-solving skills to address issues related to contamination, adulteration, impurity identification, and quality assurance.</p>	<p>CO3:Understand the principles of various techniques such as chromatography, spectrophotometry, titration, and bomb calorimetry.</p> <p>CO4:Develop problem-solving skills to address issues related to contamination, adulteration, impurity identification, and quality assurance.</p>
31	CC-2208D	Advanced Methods in Chemical Analysis	2023-24	<p>CO1:Understand the fluorescence and phosphorescence spectrophotometry. They will be able to explain the different types of luminescence, understand the theories behind fluorescence and phosphorescence, and discuss electronic transitions, solvatochromism, and solvation dynamics.</p> <p>CO2:Adopt various kinetic methods of analysis. They will understand the theoretical basis behind kinetic techniques and be able to apply methods such as the Tangent Method, Fixed Time and Concentration Method, and Addition Method to determine the amount of substances in various samples.</p> <p>CO3:Grasp the photoelectron spectroscopy and X-ray spectroscopy techniques. They will understand the basic principles of photoelectric effects, photoionization processes, Koopman's theorem, and the interpretation of photoelectron spectra.</p> <p>CO4:Apply their knowledge of spectroscopic techniques to practical applications in analytical chemistry and research. They will understand how fluorescence sensing, synchronous spectra, and fluorescent nanomaterials can be utilized for specific analytical purposes.</p>	<p>CO1:Understand the fluorescence and phosphorescence spectrophotometry. They will be able to explain the different types of luminescence, understand the theories behind fluorescence and phosphorescence, and discuss electronic transitions, solvatochromism, and solvation dynamics.</p> <p>CO2:Adopt various kinetic methods of analysis. They will understand the theoretical basis behind kinetic techniques and be able to apply methods such as the Tangent Method, Fixed Time and Concentration Method, and Addition Method to determine the amount of substances in various samples.</p> <p>CO3:Grasp the photoelectron spectroscopy and X-ray spectroscopy techniques. They will understand the basic principles of photoelectric effects, photoionization processes, Koopman's theorem, and the interpretation of photoelectron spectra.</p> <p>CO4:Apply their knowledge of spectroscopic techniques to practical applications in analytical chemistry and research. They will understand how fluorescence sensing, synchronous spectra, and fluorescent nanomaterials can be utilized for specific analytical purposes.</p>	<p>CO1:Understand the fluorescence and phosphorescence spectrophotometry. They will be able to explain the different types of luminescence, understand the theories behind fluorescence and phosphorescence, and discuss electronic transitions, solvatochromism, and solvation dynamics.</p> <p>CO2:Adopt various kinetic methods of analysis. They will understand the theoretical basis behind kinetic techniques and be able to apply methods such as the Tangent Method, Fixed Time and Concentration Method, and Addition Method to determine the amount of substances in various samples.</p> <p>CO3:Grasp the photoelectron spectroscopy and X-ray spectroscopy techniques. They will understand the basic principles of photoelectric effects, photoionization processes, Koopman's theorem, and the interpretation of photoelectron spectra.</p> <p>CO4:Apply their knowledge of spectroscopic techniques to practical applications in analytical chemistry and research. They will understand how fluorescence sensing, synchronous spectra, and fluorescent nanomaterials can be utilized for specific analytical purposes.</p>
32	CC-2209D	Industrial Analytical Chemistry	2023-24	<p>CO1:Apply the various spectrochemical methods used for analytical purposes. They will understand the principles behind electronic spectra and molecular structure, be familiar with near-infrared (NIR) spectrometry for non-destructive testing, and comprehend the use of FTIR spectrometry, fluorometry, and optical sensors</p> <p>CO2:Analyze metals and alloys. They will understand the composition analysis of foundry materials, ferroalloys, special steels, and various alloys like bronze, brass, Alnico, and Nichrome.</p> <p>CO3:Understand the soil fertility determination, analysis of inorganic constituents in plant materials, and the chemical analysis as a measure</p>	<p>CO1:Apply the various spectrochemical methods used for analytical purposes. They will understand the principles behind electronic spectra and molecular structure, be familiar with near-infrared (NIR) spectrometry for non-destructive testing, and comprehend the use of FTIR spectrometry, fluorometry, and optical sensors</p> <p>CO2:Analyze metals and alloys. They will understand the composition analysis of foundry materials, ferroalloys, special steels, and various alloys like bronze, brass, Alnico, and Nichrome.</p> <p>CO3:Understand the soil fertility determination, analysis of inorganic constituents in plant materials, and the chemical analysis as a measure</p>	<p>CO1:Apply the various spectrochemical methods used for analytical purposes. They will understand the principles behind electronic spectra and molecular structure, be familiar with near-infrared (NIR) spectrometry for non-destructive testing, and comprehend the use of FTIR spectrometry, fluorometry, and optical sensors</p> <p>CO2:Analyze metals and alloys. They will understand the composition analysis of foundry materials, ferroalloys, special steels, and various alloys like bronze, brass, Alnico, and Nichrome.</p> <p>CO3:Understand the soil fertility determination, analysis of inorganic constituents in plant materials, and the chemical analysis as a measure of soil</p>

				of soil fertility. Students will be able to analyze fertilizers for their nutrient content and quality. CO4: Understand the analysis of explosive materials such as TNT, RDX, lead azide, and EDNA. Additionally, students will be proficient in analyzing conducting polymers, resins, rubber, luminescent paints, lubricants, and adhesives, utilizing appropriate analytical techniques and methods.	of soil fertility. Students will be able to analyze fertilizers for their nutrient content and quality. CO4: Understand the analysis of explosive materials such as TNT, RDX, lead azide, and EDNA. Additionally, students will be proficient in analyzing conducting polymers, resins, rubber, luminescent paints, lubricants, and adhesives, utilizing appropriate analytical techniques and methods.	fertility. Students will be able to analyze fertilizers for their nutrient content and quality. CO4: Understand the analysis of explosive materials such as TNT, RDX, lead azide, and EDNA. Additionally, students will be proficient in analyzing conducting polymers, resins, rubber, luminescent paints, lubricants, and adhesives, utilizing appropriate analytical techniques and methods.
M. Sc. Chemistry (NEP: Newly Introduced Between 2023-24 and Onward)						
33	DSC - I: Major Paper: Inorganic & Organic Chemistry	DSC14CH E11	2023-24	CO1: Learn transition elements and the role of various metals and nonmetals in our health. CO2: Impart essential knowledge regarding the characteristics, properties, applications, and separation of lanthanides and actinides. CO3: Identify different types of chirality, stereoisomerism, and concept involved in stereoisomers. CO4: Adopt the types of reactions, transition states and intermediates, generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, and nitrenes and the effect of structure on reactivity.	CO1: Learn transition elements and the role of various metals and nonmetals in our health. CO2: Impart essential knowledge regarding the characteristics, properties, applications, and separation of lanthanides and actinides. CO3: Identify different types of chirality, stereoisomerism, and concept involved in stereoisomers. CO4: Adopt the types of reactions, transition states and intermediates, generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, and nitrenes and the effect of structure on reactivity.	CO1: Learn transition elements and the role of various metals and nonmetals in our health. CO2: Impart essential knowledge regarding the characteristics, properties, applications, and separation of lanthanides and actinides. CO3: Identify different types of chirality, stereoisomerism, and concept involved in stereoisomers. CO4: Adopt the types of reactions, transition states and intermediates, generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, and nitrenes and the effect of structure on reactivity.
34	DSC-II: Major Paper: Physical & Analytical Chemistry	DSC14CH E12	2023-24	CO1: Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, Physical interpretation of the ψ and ψ^2 . Particle in a one dimensional box. CO2: Know about chemical and physical methods of kinetics of a reaction, Steady state approximation and its examples, Classification of catalysis, mathematical expression of autocatalytic reactions, Michaelis–Menten enzyme catalysis, CO3: Demonstrate a comprehensive understanding of quality control techniques, quality management systems, GLP, and GMP in analytical chemistry and pharmaceutical industries. CO4: Gain proficiency in NMR and MS techniques and deduce structural information of organic compounds.	CO1: Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, Physical interpretation of the ψ and ψ^2 . Particle in a one dimensional box. CO2: Know about chemical and physical methods of kinetics of a reaction, Steady state approximation and its examples, Classification of catalysis, mathematical expression of autocatalytic reactions, Michaelis–Menten enzyme catalysis, CO3: Demonstrate a comprehensive understanding of quality control techniques, quality management systems, GLP, and GMP in analytical chemistry and pharmaceutical industries. CO4: Gain proficiency in NMR and MS techniques and deduce structural information of organic compounds.	CO1: Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, Physical interpretation of the ψ and ψ^2 . Particle in a one dimensional box. CO2: Know about chemical and physical methods of kinetics of a reaction, Steady state approximation and its examples, Classification of catalysis, mathematical expression of autocatalytic reactions, Michaelis–Menten enzyme catalysis, CO3: Demonstrate a comprehensive understanding of quality control techniques, quality management systems, GLP, and GMP in analytical chemistry and pharmaceutical industries. CO4: Gain proficiency in NMR and MS techniques and deduce structural information of organic compounds.
35	RMD I: Research	RMD14C HE11	2023-24	CO1: Acquire knowledge about fundamental concepts of research methodology and develop research aptitude.	CO1: Acquire knowledge about fundamental concepts of research methodology and develop research aptitude.	CO1: Acquire knowledge about fundamental concepts of research methodology and develop research aptitude.

	Methodology			<p>CO2:Inculcate mechanics of report writing and interpretation.</p> <p>CO3:Understand the role and applications of computers and various software in the area of research and development.</p> <p>CO4:Analyze the data with the help of various advanced instrumental techniques.</p>	<p>CO2:Inculcate mechanics of report writing and interpretation.</p> <p>CO3:Understand the role and applications of computers and various software in the area of research and development.</p> <p>CO4:Analyze the data with the help of various advanced instrumental techniques</p>	<p>CO2:Inculcate mechanics of report writing and interpretation.</p> <p>CO3:Understand the role and applications of computers and various software in the area of research and development.</p> <p>CO4:Analyze the data with the help of various advanced instrumental techniques</p>
36	DSE - I: Elective Paper I: Inorganic Chemistry: Advanced Inorganic Chemistry	DSE14CH E11	2023-24	<p>CO1:Improve the level of understanding of structure, method of preparation, reactions and applications of organometallic compound in various fields.</p> <p>CO2:Gain a thorough knowledge of preparation, structure, physical and chemical properties of metal carbonyls and their related compounds.</p> <p>CO3:Grasp the synthesis and applications of the inorganic materials in optical, electrical and electronic devices.</p> <p>CO4:Study of all chemical properties of solutes in Chemistry and develop interest in various nuclear reactions and applications of radioactivity in various fields.</p>	<p>CO1:Improve the level of understanding of structure, method of preparation, reactions and applications of organometallic compound in various fields.</p> <p>CO2:Gain a thorough knowledge of preparation, structure, physical and chemical properties of metal carbonyls and their related compounds.</p> <p>CO3:Grasp the synthesis and applications of the inorganic materials in optical, electrical and electronic devices.</p> <p>CO4:Study of all chemical properties of solutes in Chemistry and develop interest in various nuclear reactions and applications of radioactivity in various fields.</p>	<p>CO1:Improve the level of understanding of structure, method of preparation, reactions and applications of organometallic compound in various fields.</p> <p>CO2:Gain a thorough knowledge of preparation, structure, physical and chemical properties of metal carbonyls and their related compounds.</p> <p>CO3:Grasp the synthesis and applications of the inorganic materials in optical, electrical and electronic devices.</p> <p>CO4:Study of all chemical properties of solutes in Chemistry and develop interest in various nuclear reactions and applications of radioactivity in various fields.</p>
37	DSE - II: Elective Paper II: Organic Chemistry: Basics in Organic Chemistry	DSE14CH E12	2023-24	<p>CO1:Study the SN2, SN1, mixed SN1 and SN2, SNi mechanisms. Along with this, they will also gain information about neighbouring group participation by pi and sigma bonds, and anchimeric assistance.</p> <p>CO2:Understand Delocalized chemical bonding, Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel'srule, annulenes, and antiaromaticity.</p> <p>CO3:Learn about the hydroboration reactions of alkenes and alkynes and identify the mechanism involved and regio-stereo-chemistry of hydroboration.</p> <p>CO4:Understand the importance of organo-lithium, copper, aluminium, zinc, titanium, mercury and cobalt in organic synthesis.</p>	<p>CO1:Study the SN2, SN1, mixed SN1 and SN2, SNi mechanisms. Along with this, they will also gain information about neighbouring group participation by pi and sigma bonds, and anchimeric assistance.</p> <p>CO2:Understand Delocalized chemical bonding, Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel'srule, annulenes, and antiaromaticity.</p> <p>CO3:Learn about the hydroboration reactions of alkenes and alkynes and identify the mechanism involved and regio-stereo-chemistry of hydroboration.</p> <p>CO4:Understand the importance of organo-lithium, copper, aluminium, zinc, titanium, mercury and cobalt in organic synthesis.</p>	<p>CO1:Study the SN2, SN1, mixed SN1 and SN2, SNi mechanisms. Along with this, they will also gain information about neighbouring group participation by pi and sigma bonds, and anchimeric assistance.</p> <p>CO2:Understand Delocalized chemical bonding, Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel'srule, annulenes, and antiaromaticity.</p> <p>CO3:Learn about the hydroboration reactions of alkenes and alkynes and identify the mechanism involved and regio-stereo-chemistry of hydroboration.</p> <p>CO4:Understand the importance of organo-lithium, copper, aluminium, zinc, titanium, mercury and cobalt in organic synthesis.</p>
38	DSE - III: Elective Paper III:	DSE14CH E13	2023-24	<p>CO1:Gain knowledge about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation.</p>	<p>CO1:Gain knowledge about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation.</p>	<p>CO1:Gain knowledge about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation.</p>

	Physical Chemistry			<p>CO2:Adopt information about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.</p> <p>CO3:Grasp the knowledge of sol, micelle, BET equation and applications of photoelectron spectroscopy.</p> <p>CO4:Learn about polymer, methods of determining molecular weights, Polymer processing techniques, and rubber.</p>	<p>CO2:Adopt information about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.</p> <p>CO3:Grasp the knowledge of sol, micelle, BET equation and applications of photoelectron spectroscopy.</p> <p>CO4:Learn about polymer, methods of determining molecular weights, Polymer processing techniques, and rubber.</p>	<p>CO2:Adopt information about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.</p> <p>CO3:Grasp the knowledge of sol, micelle, BET equation and applications of photoelectron spectroscopy.</p> <p>CO4:Learn about polymer, methods of determining molecular weights, Polymer processing techniques, and rubber.</p>
39	DSE - IV: Elective Paper IV: Analytical Chemistry	DSE14CHE14	2023-24	<p>CO1 Learn about the introduction of electronic and Raman spectroscopy. They are also able to explain the difference between Stokes and anti-Stokes lines in a Raman spectrum. Justify the difference in intensity between Stokes and anti-Stokes lines.</p> <p>CO2 Explain the principles and operation of a range of advanced techniques such as X-ray, spectroscopic, microscopic, and used in the characterization of various materials and compounds.</p> <p>CO3 Learn about thermal, and electroanalytical, currently used in the characterization of various materials and compounds.</p> <p>CO4 Grasp about the instrumentation and applications of AAS and ICP in trace elements analysis. They will also learn about the plasma torch and precise optical sensors</p>	<p>CO1 Learn about the introduction of electronic and Raman spectroscopy. They are also able to explain the difference between Stokes and anti-Stokes lines in a Raman spectrum. Justify the difference in intensity between Stokes and anti-Stokes lines.</p> <p>CO2 Explain the principles and operation of a range of advanced techniques such as X-ray, spectroscopic, microscopic, and used in the characterization of various materials and compounds.</p> <p>CO3 Learn about thermal, and electroanalytical, currently used in the characterization of various materials and compounds.</p> <p>CO4 Grasp about the instrumentation and applications of AAS and ICP in trace elements analysis. They will also learn about the plasma torch and precise optical sensors</p>	<p>CO1 Learn about the introduction of electronic and Raman spectroscopy. They are also able to explain the difference between Stokes and anti-Stokes lines in a Raman spectrum. Justify the difference in intensity between Stokes and anti-Stokes lines.</p> <p>CO2 Explain the principles and operation of a range of advanced techniques such as X-ray, spectroscopic, microscopic, and used in the characterization of various materials and compounds.</p> <p>CO3 Learn about thermal, and electroanalytical, currently used in the characterization of various materials and compounds.</p> <p>CO4 Grasp about the instrumentation and applications of AAS and ICP in trace elements analysis. They will also learn about the plasma torch and precise optical sensors</p>
40	DSC - III: Major Paper: Inorganic & Organic Chemistry	DSC14CHE21	2023-24	<p>CO1 Study the synthesis, properties and structure of halides and oxides of the non-transition elements.</p> <p>CO2 Gain an understanding of spatial arrangement and the nature of bonding in the case of main group compounds and important aspects of the stability of metal complexes.</p> <p>CO3 Understand the organic reactions induced by photons, especially by various functional groups, and their mechanism</p> <p>CO4 Know about the types of organic transformations based on the name of the reaction and mechanisms as well as applications of these name reactions in organic synthesis.</p>	<p>CO1 Study the synthesis, properties and structure of halides and oxides of the non-transition elements.</p> <p>CO2 Gain an understanding of spatial arrangement and the nature of bonding in the case of main group compounds and important aspects of the stability of metal complexes.</p> <p>CO3 Understand the organic reactions induced by photons, especially by various functional groups, and their mechanism</p> <p>CO4 Know about the types of organic transformations based on the name of the reaction and mechanisms as well as applications of these name reactions in organic synthesis.</p>	<p>CO1 Study the synthesis, properties and structure of halides and oxides of the non-transition elements.</p> <p>CO2 Gain an understanding of spatial arrangement and the nature of bonding in the case of main group compounds and important aspects of the stability of metal complexes.</p> <p>CO3 Understand the organic reactions induced by photons, especially by various functional groups, and their mechanism</p> <p>CO4 Know about the types of organic transformations based on the name of the reaction and mechanisms as well as applications of these name reactions in organic synthesis.</p>
41	DSC-IV: Major Paper:	DSC14CHE22	2023-24	<p>CO1 Learn and understand the Entropy, Maxwell relations, Duhem-Margules and Gibbs-Duhem equation, Henry's law.</p>	<p>CO1 Learn and understand the Entropy, Maxwell relations, Duhem-Margules and Gibbs-Duhem equation, Henry's law.</p>	<p>CO1 Learn and understand the Entropy, Maxwell relations, Duhem-Margules and Gibbs-Duhem equation, Henry's law.</p>

	Physical & Analytical Chemistry			<p>CO2 Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.</p> <p>CO3 Gain a comprehensive understanding of TGA, DTA, DSC, and their significance in analytical chemistry. They will learn the principles, instrumentation, and working of these techniques, exploring the effects of heat on materials, including chemical decomposition and phase transformation. Additionally, students will analyze TGA curves, interpret compound qualities, and apply thermal analysis methods in research and analytical implications. They will also practice problem-solving in TGA, DTA, and DSC, enhancing their analytical skills in thermal analysis.</p> <p>CO4 Understand Ultraviolet Spectroscopy and Infrared Spectroscopy. They will gain expertise in identifying characteristic vibrational frequencies of functional groups and explore the effects of hydrogen bonding and solvent on vibrational frequencies.</p>	<p>CO2 Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.</p> <p>CO3 Gain a comprehensive understanding of TGA, DTA, DSC, and their significance in analytical chemistry. They will learn the principles, instrumentation, and working of these techniques, exploring the effects of heat on materials, including chemical decomposition and phase transformation. Additionally, students will analyze TGA curves, interpret compound qualities, and apply thermal analysis methods in research and analytical implications. They will also practice problem-solving in TGA, DTA, and DSC, enhancing their analytical skills in thermal analysis.</p> <p>CO4 Understand Ultraviolet Spectroscopy and Infrared Spectroscopy. They will gain expertise in identifying characteristic vibrational frequencies of functional groups and explore the effects of hydrogen bonding and solvent on vibrational frequencies.</p>	<p>CO2 Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.</p> <p>CO3 Gain a comprehensive understanding of TGA, DTA, DSC, and their significance in analytical chemistry. They will learn the principles, instrumentation, and working of these techniques, exploring the effects of heat on materials, including chemical decomposition and phase transformation. Additionally, students will analyze TGA curves, interpret compound qualities, and apply thermal analysis methods in research and analytical implications. They will also practice problem-solving in TGA, DTA, and DSC, enhancing their analytical skills in thermal analysis.</p> <p>CO4 Understand Ultraviolet Spectroscopy and Infrared Spectroscopy. They will gain expertise in identifying characteristic vibrational frequencies of functional groups and explore the effects of hydrogen bonding and solvent on vibrational frequencies.</p>
42	DSE - V: Elective Paper I: Inorganic Chemistry: Applied Inorganic Chemistry	DSE14CH E21	2023-24	<p>CO1 Get a basic understanding of the medicinal use of metal complexes as antibacterial, antiviral, antibiotics, and related compounds.</p> <p>CO2 Understand synthetic oxygen carriers, role of globin chain, oxygen storage and its fascinating aspects.</p> <p>CO3 Impart essential knowledge regarding general properties of polymer, types of phosphorus, silicon and coordination polymer is explained.</p> <p>CO4 Study the important aspects of the metal complexes in inorganic qualitative analysis, the separation of metals, medicinal chemistry, industrial processes, and agriculture is explained.</p>	<p>CO1 Get a basic understanding of the medicinal use of metal complexes as antibacterial, antiviral, antibiotics, and related compounds.</p> <p>CO2 Understand synthetic oxygen carriers, role of globin chain, oxygen storage and its fascinating aspects.</p> <p>CO3 Impart essential knowledge regarding general properties of polymer, types of phosphorus, silicon and coordination polymer is explained.</p> <p>CO4 Study the important aspects of the metal complexes in inorganic qualitative analysis, the separation of metals, medicinal chemistry, industrial processes, and agriculture is explained.</p>	<p>CO1 Get a basic understanding of the medicinal use of metal complexes as antibacterial, antiviral, antibiotics, and related compounds.</p> <p>CO2 Understand synthetic oxygen carriers, role of globin chain, oxygen storage and its fascinating aspects.</p> <p>CO3 Impart essential knowledge regarding general properties of polymer, types of phosphorus, silicon and coordination polymer is explained.</p> <p>CO4 Study the important aspects of the metal complexes in inorganic qualitative analysis, the separation of metals, medicinal chemistry, industrial processes, and agriculture is explained.</p>
43	DSE - VI: Elective Paper II: Organic Chemistry: Fundame	DSE14CH E22	2023-24	<p>CO1 Understand the applications of different oxidizing reagents and oxidation reactions and their mechanism.</p> <p>CO2 Understand the applications of different reducing reagents in organic synthesis and their mechanism.</p> <p>CO3 Know about the different disconnection approaches with chemoselectivity and reversal of polarity, Types of alkylation and alkylating agents.</p>	<p>CO1 Understand the applications of different oxidizing reagents and oxidation reactions and their mechanism.</p> <p>CO2 Understand the applications of different reducing reagents in organic synthesis and their mechanism.</p> <p>CO3 Know about the different disconnection approaches with chemoselectivity and reversal of polarity, Types of alkylation and alkylating agents.</p>	<p>CO1 Understand the applications of different oxidizing reagents and oxidation reactions and their mechanism.</p> <p>CO2 Understand the applications of different reducing reagents in organic synthesis and their mechanism.</p> <p>CO3 Know about the different disconnection approaches with chemoselectivity and reversal of polarity, Types of alkylation and alkylating agents.</p>

	ntal Organic Chemistry			CO4 Know use of advanced techniques such as supported reagents, magnetic nanoparticles, electro-organic synthesis, ionic liquids, and enzyme catalysed reactions, MCRs, MW and US techniques in organic synthesis.	CO4 Know use of advanced techniques such as supported reagents, magnetic nanoparticles, electro-organic synthesis, ionic liquids, and enzyme catalysed reactions, MCRs, MW and US techniques in organic synthesis.	CO4 Know use of advanced techniques such as supported reagents, magnetic nanoparticles, electro-organic synthesis, ionic liquids, and enzyme catalysed reactions, MCRs, MW and US techniques in organic synthesis.
44	DSE - VII: Elective Paper III: Physical Chemistry (DSE14CH E23	2023-24	CO1 Know about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation will be gained by the students.. CO2 Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon. CO3 Gain about Metals, insulators and semiconductors, properties of semi conductor, and applications of the semiconductor. CO4 Grasp knowledge about material preparation, lattice and atomic defects.	CO1 Know about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation will be gained by the students.. CO2 Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon. CO3 Gain about Metals, insulators and semiconductors, properties of semi conductor, and applications of the semiconductor. CO4 Grasp knowledge about material preparation, lattice and atomic defects	CO1 Know about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation will be gained by the students.. CO2 Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon. CO3 Gain about Metals, insulators and semiconductors, properties of semi conductor, and applications of the semiconductor. CO4 Grasp knowledge about material preparation, lattice and atomic defects
45	DSE - VIII: Elective Paper IV: Analytical Chemistry	DSE14CH E24	2023-24	CO1 Gain a comprehensive understanding of chromatographic techniques, including partition chromatography, thin layer chromatography, and column chromatography. They will learn about the general principles, classification, and chromatographic behavior of solutes. They will explore applications and advances in TLC, including modern techniques. CO2 Develop expertise in advanced gas chromatographic techniques, understanding plate theory, instrumentation, and working of a Gas Chromatograph. They will be familiar with sampling, sample pretreatment, sample injection types, columns, detectors, programmed temperature G.C., and pyrolysis gas and vapor phase chromatography. Moreover, students will gain insights into gas chromatography-mass spectrometry and its applications, as well as the significance of TGA-MS/TGA-GC-MS. CO3 Achieve proficiency in advanced liquid chromatographic techniques, focusing on high-performance liquid chromatography (HPLC) and ultra-performance liquid chromatography (UPLC). They will learn about the principles, instrumentation, mobile phase, stationary support in HPLC, detectors, and applications. Moreover, they will explore supercritical fluid	CO1 Gain a comprehensive understanding of chromatographic techniques, including partition chromatography, thin layer chromatography, and column chromatography. They will learn about the general principles, classification, and chromatographic behavior of solutes. They will explore applications and advances in TLC, including modern techniques. CO2 Develop expertise in advanced gas chromatographic techniques, understanding plate theory, instrumentation, and working of a Gas Chromatograph. They will be familiar with sampling, sample pretreatment, sample injection types, columns, detectors, programmed temperature G.C., and pyrolysis gas and vapor phase chromatography. Moreover, students will gain insights into gas chromatography-mass spectrometry and its applications, as well as the significance of TGA-MS/TGA-GC-MS. CO3 Achieve proficiency in advanced liquid chromatographic techniques, focusing on high-performance liquid chromatography (HPLC) and ultra-performance liquid chromatography (UPLC). They will learn about the principles, instrumentation, mobile phase, stationary support in HPLC, detectors, and applications. Moreover, they will explore supercritical fluid	CO1 Gain a comprehensive understanding of chromatographic techniques, including partition chromatography, thin layer chromatography, and column chromatography. They will learn about the general principles, classification, and chromatographic behavior of solutes. They will explore applications and advances in TLC, including modern techniques. CO2 Develop expertise in advanced gas chromatographic techniques, understanding plate theory, instrumentation, and working of a Gas Chromatograph. They will be familiar with sampling, sample pretreatment, sample injection types, columns, detectors, programmed temperature G.C., and pyrolysis gas and vapor phase chromatography. Moreover, students will gain insights into gas chromatography-mass spectrometry and its applications, as well as the significance of TGA-MS/TGA-GC-MS. CO3 Achieve proficiency in advanced liquid chromatographic techniques, focusing on high-performance liquid chromatography (HPLC) and ultra-performance liquid chromatography (UPLC). They will learn about the principles, instrumentation, mobile phase, stationary support in HPLC, detectors, and applications. Moreover, they will explore supercritical fluid chromatography

			<p>chromatography (SCFC) and liquid chromatography-mass spectrometry interface, understanding their instrumentation and applications.</p> <p>CO4 Gain in-depth knowledge of ion chromatography and size exclusion chromatography. They will explore analytical applications and environmental speciation by ion chromatography. Additionally, students will understand the principles and applications of size exclusion chromatography.</p>	<p>chromatography (SCFC) and liquid chromatography-mass spectrometry interface, understanding their instrumentation and applications.</p> <p>CO4 Gain in-depth knowledge of ion chromatography and size exclusion chromatography. They will explore analytical applications and environmental speciation by ion chromatography. Additionally, students will understand the principles and applications of size exclusion chromatography.</p>	<p>(SCFC) and liquid chromatography-mass spectrometry interface, understanding their instrumentation and applications.</p> <p>CO4 Gain in-depth knowledge of ion chromatography and size exclusion chromatography. They will explore analytical applications and environmental speciation by ion chromatography. Additionally, students will understand the principles and applications of size exclusion chromatography.</p>
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S. D. Shirke
Dr. (Mrs). S, D, Shirke
HEAD
DEPARTMENT OF CHEMISTRY
VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED AUTONOMOUS)