DEPARTMENT OF CHEMISTRY

Programme Specific Outcome

PSO1 Have sound knowledge about the fundamentals and applications of chemical and scientific theories

PSO2 Every branch of Science and Technology is related to Chemistry

PSO3 Easily assess the properties of all elements discovered.

PSO4 Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO5 Will become familiar with the different branches of chemistry like analytical, organic, inorganic , physical, environmental, polymer and biochemistry

PSO6 Helps in understanding the causes of environmental pollution and can open up new methods for environmental pollution control.

PSO7 Develops analytical skills and problem solving skills requiring application of chemical principles.

PSO8 Acquires the ability to synthesise, separate and characterize compounds using laboratory and instrumentation techniques.

Degree

SEMESTER I

Course Code: CHE1B01 Core Course I: THEORETICAL AND INORGANIC CHEMISTRY - I Total Hours: 36; Credits: 2; Hours/Week: 2

CO1 Difference between science and pseudo science

CO2 How to design a research programme and explain the components of a research project.

CO3 Describe laboratory hygiene and safety measures

CO4 Explanation of MSDS and R and S phrases

CO5 Describe double burette method , volumetric analysis

CO6 Explain significant figures,absolute error, relative error, mean, median and standard deviation.

CO7 Explain Dalton’s atomic theory, Thomson’s atom model and Rutherford’s atom model

CO8 Describe black body radiation, Planck's Quantum Hypothesis and Photo Electric Effect.

CO9 Explain Bohr atom model and Sommerfield modification

CO10 Explain different modes of radio active decay, theories of disintegration and artificial radio activity

CO11 Describe nuclear stability, nuclear forces , fission and fusion

CO12 Explain Aston's mass spectrograph, separation of isotopes, ^{14}C dating and Rock dating

SEMESTER II

Course Code: CHE2B02 Core Course II: THEORETICAL AND INORGANIC CHEMISTRY - II Total Hours: 36; Credits: 2; Hours/Week: 2

CO1 State the postulates of Quantum Mechanics

CO2 Apply Schrodinger wave equation to particle in 1 D box and 3 D box and H atom

CO3 Explain quantum numbers and its significance

CO4 Apply Schrodinger equation for multi electron atoms

CO5 State modern periodic law and explain periodicity in properties

CO6 Describe Pauling and Mullicken scales to measure electronegativities

CO7 Explain ionic bond, Born Lande equation ,Born Haber cycle and Fajan's rules

CO8 State VSEPR theory, hybridisation and shapes of various molecules

CO9 Explain MO Theory and draw the MO diagrams for H_2,He_2,B_2,N_2,O_2,CO and NO

CO10 Compare MO and VB theory .

SEMESTER III

Course Code: CHE3B03 Core Course III: PHYSICAL CHEMISTRY– I Total Hours: 54; Credits: 3; Hours/Week: 3

CO1 Explain the postulates of kinetic theory of gases and derive the kinetic gas equation

CO2 Describe Maxwell's distribution of molecular velocities

CO3 Discuss the deviation of real gases from ideal behaviour, derive van der Waals' equation of state, and explain its significance

CO4 Explain critical phenomena and determination of critical constants

CO5 Introduce general properties of liquid state

CO5 Describe in detail vapour pressure and surface tension and important applications

CO6 Explain viscosity and its measurement and also discuss how molar refraction measurements are useful in the structural elucidation

SEMESTER IV

Course Code: CHE4B04 Core Course IV: ORGANIC CHEMISTRY– I Total Hours: 54; Credits: 3; Hours/Week: 3

CO1 Explain the different types of structural and stereo isomers

CO2 Represent organic molecules by Fischer, Flying wedge, Sawhorse and Newman projection formulas

CO3 Conformational isomerism of ethane, n-butane , cyclohexane

CO4 Explain optical isomerism in compounds containing asymmetric carbon like glyceraldehyde, lactic acid and tartaric acid.

CO5 Explain optical isomerism in compounds lacking asymmetric carbon atoms like biphenyls and allenes

CO5 Geometrical isomerism and the methods to distinguish the isomers

CO6 Electron displacement effect with suitable examples

CO7 Reaction intermediates ,their stability and formation

CO8 Preparation and properties of aliphatic and aromatic hydrocarbons

CO9 Aromaticity, Huckel's rule and its applications

CO10 Compare the basicity of (i) pyrrole and pyridine (ii) indole and quinoline

SEMESTER IV

Course Code: CHE4B05(P) Core Course V: INORGANIC CHEMISTRY PRACTICAL - I Total Hours: 144; Credits: 4; Hours/Week: 2 (I, II, III & IV Semesters)

CO1 Use double burette method and burette –pipette methods for titration

CO2 Prepare standard solutions

CO3 Conduct acid base titrations, complexometric titrations and redox titrations like permanganometry, dichrometry and iodometric-iodimetric titrations.

CO4 Different indicators used in titrations

CO5 Determination of COD of water samples

CO 6. Estimation of citric acid in lemon or orange.

SEMESTER V

Course Code: CHE5B06 Core Course VI: INORGANIC CHEMISTRY - III Total Hours: 54; Credits: 3; Hours/Week: 3

CO1 Analytical chemistry gives a good perspective of the theories underlying the elimination of interfering radicals in the qualitative mixture analysis.

CO2 Develops accuracy and precision in doing experiments, understands the different errors and methods for minimising errors.

CO3 Introduction of micro scale analysis methods in organic and inorganic analysis and their advantages.

CO4 Develop skills to understand the periodic properties of elements in each group in the periodic table.

CO5 Explain the water quality parameters and their determination.

CO6 Understands the major environmental pollutants, their effects and methods adopted to control pollution

CO7 Understands solid waste management methods.

Course Code: CHE5B07 Core Course VII: ORGANIC CHEMISTRY - II Total Hours: 72; Credits: 3; Hours/Week: 4

CO1 Describe the preparation and properties of organic compounds with different functional groups like halogens, alcohols, phenols, aldehydes, ketones, ethers, epoxides

CO2 Write down chemical equations for the preparation of organo metallic compounds like Grignard reagent, dialkyl zinc, alkyl lithium and their important reactions.

CO3 Different methods for the preparation of important nitro, amino, diazonium and active methylene compounds and their important reactions

CO4 Identify a number of named reactions.

CO5 Write down the mechanisms of Pinacol–pinacolone rearrangement, Riemer-Tiemann reaction Kolbe electrolysis.

CO6 Explain the preparation of some heterocyclic compounds like Furan, Pyridine and Indole

CO7 Describe the estimation of urea by hypobromite method and urease method.

CO8 How to separate a mixture of amines.

CO9 Describe the basicity of amines and acidity of carboxylic acids

CO10 How to distinguish aldehydes from Ketones

SEMESTER V

Course Code: CHE5B08 Core Course VIII: PHYSICAL CHEMISTRY - II Total Hours: 72; Credits: 3; Hours/Week: 4

CO1. Describe the energy levels in molecules

CO2. Derive the expression for rotational energy of a rigid diatomic molecule

CO3. Explain the allowed rotational energy levels

CO4. Write down the selection rules for rotational transitions

CO5. Explain the applications of microwave spectroscopy

CO6. Describe the vibrational energy levels of a molecule

CO7. Explain hot bands

CO8. Discuss the concept of group frequencies

CO9. Explain fingerprint region

CO10. Write down the rule of mutual exclusion principle

Course Code: CHE5DO1 Open Course I: ENVIRONMENTAL CHEMISTRY - Total Hours: 36; Credits: 2; Hours/Week: 2

CO1. Explain hydrological cycle.

CO2. Write down visible signs of aquatic pollution.

CO3. Discuss Eutrophication

CO4. Explain the types of water pollutants.

CO5. Define biological agents, physical agents and chemical agents.

CO6. Explain biological magnification

CO7. Write notes on water quality parameters: DO, BOD, COD.

CO8. Describe radioactive pollution

CO9. Discuss oil pollution

CO10. Explain Minamata disaster.

SEMESTER VI

Course Code: CHE6B09 Core Course IX: INORGANIC CHEMISTRY - IV Total Hours: 54; Credits: 3; Hours/Week

CO1 Explain the different methods for the refining of metals

CO2 Explain the metallurgy of Al,Fe,Ni,Cu and Ti

CO3 Explain the preparation , properties , structure and uses of $KMnO_4$, and $K_2Cr_2O_7$

CO4 Compare the general characteristics of lanthanides and actinides

CO5 Explain VBT, CFT and MOT of co-ordination complexes.

CO6 Explain the applications of complexes in qualitative and quantitative analysis

CO7 Explain the preparation, properties and bonding in Ferrocene

CO8 Explain the applications of organometallic compounds

CO9 Differentiate between haemoglobin and myoglobin and explain oxygen binding mechanism.

CO10 Explain sodium- potassium pump

CO11 Explain the structure and significance of cis- platin, oxaliplatin and carboplatin

SEMESTER VI

Course Code: CHE6BO10 Core Course X: ORGANIC CHEMISTRY - III Total Hours: 54; Credits: 3; Hours/Week: 3

SEMESTER VI

Course Code: CHE6B11 Core Course XI: PHYSICAL CHEMISTRY - III Total Hours: 54; Credits: 3; Hours/Week: 3

CO1 State Faraday's law, Kohlrausch's law and Ostwald's dilution law and explain De Bye Huckel Onsagar equation

CO2 Determination of transport number by Hittorf's and moving boundary methods

CO3 Describe conductometric and potentiometric titrations

CO4 Explain reversible cell and different types of reversible electrodes

CO5 Explain the applicatoions of emf measurements

CO6 Explain the theories of acids and bases and hydrolysis of salts of all types.

CO7 Buffer solutions and derivation of Henderson's equation

CO8 Explain the application of colligative properties in determining molecular mass.

CO9 Derive Bragg equation and explain Miller indices

CO10 Explain rotating crystal and powder pattern method

CO11 Describe the structure of AB and AB_2 types of ionic compounds

CO12 Explain stoichiometric and non stoichiometric defects in crystals

SEMESTER VI

Course Code: CHE6B12 Core Course XII: ADVANCED AND APPLIED CHEMISTRY Total Hours: 54; Credits: 3; Hours/Week: 3

CO1 Classification of mnanomaterials and applications of nano materials.

CO2 Basic ideas of supra molecular chemistry, green chemistry, combinatorial and computational chemistry

CO3 Classification and synthesis of polymers

CO4 Manufacturing process of cement and glass

CO4 Chemical Industries in Kerala, raw materials used and the chemistry involved in the manufacture .

CO5 Chemical, generic and trade names of drugs with examples

CO6 Preparation, classification, advantages and disadvantages of soaps and detergents: Cleaning action

CO7– Composition of shaving creams and shampoos

CO8 Pesticides and their harmful effect

CO9 Classification of dyes.

CO10 Common food adulterants and preservatives used

CO11 Harmful effects of modern food habits

VI sem (Elective) CHE6B13(E2) Core Course XIII: Elective 2. POLYMER CHEMISTRY Total Hours: 54; Credits: 3; Hours/Week: 3

CO1 Classify Polymers based on their origin, mechanism of formation, citing examples.

CO2 A good knowledge about the Industrial Applications of Polymers

CO3 Calculate the different molecular weights of polymers and understand the distribution of molecular weights.

CO4 Describe the different degradation methods applied to polymers

CO5 Describe the Polymer Processsing techniques

CO6 Identify the commercially important Polymers

CO7 Write down the monomer units present in the polymers and chemical equation representing the formation

SEMESTER VI

Course Code: CHE6B14(P) Core Course XIV: PHYSICAL CHEMISTRY PRACTICAL Total Hours: 90; Credits: 4; Hours/Week: 5 (Semester V)

CO1 Determine the viscosity of various liquids using Ostwald's viscometer

CO2 Determine cryoscopic constant (Kf) of solid solvent and molecular mass of the solute using cooling curve method .

CO3 Determine transition temperature

CO4 Construct phase diagram & determine the eutectic composition and eutectic temperature: Naphthalene-biphenyl system, Naphthelene-diphenyl amine system, Biphenyl–diphenylamine system.

CO5 Determine the miscibility temperature of phenol–water system

CO6 . Experiments to find the refractive indices of KCl solutions of different concentration by refractometric method

CO7 Experimental demonstration of Conductometric and Potentiometric titration of strong acid against strong base, weak acid against strong base.

SEMESTER VI

Course Code: CHE6B15(P) Core Course XV: ORGANIC CHEMISTRY PRACTICAL Total Hours: 90; Credits: 4; Hours/Week: 5 (Semester V)

CO1 Organic qualitative analysis using microscale analysis helps in reducing the consumption of chemicals.

CO2 Prepare reagents used in the lab

CO3 Determine the physical constants like boiling point and melting point of organic compounds .

CO4 Recrystallisation of organic compounds from alcohol and water

CO5 Identify the organic compounds

CO6 Preparation of organic compounds and their derivatives

SEMESTER VI

Course Code: CHE6B16(P) Core Course XVI: INORGANIC CHEMISTRY PRACTCAL-II Total Hours: 90; Credits: 4; Hours/Week: 5

CO1 Experiments based on Gravimetric and Colorimetric analysis .

CO2 Gravimetric estimation of Barium, Sulphate,Calcium using silica crucible

CO3 Gravimetric estimation of Nickel,Copper and Magnesim using sintered crucible

CO4 Colorimetric estimation of iron, chromium and Nickel

CO5 Quantitative estimation by gravimetry and colourimetry is utilised in research laboratories and industries.

SEMESTER VI

Course Code: CHE6B17(P) Core Course XVII: INORGANIC CHEMISTRY PRACTCAL-III Total Hours: 90; Credits: 4; Hours/Week: 5

CO1 Learn systematic analysis of cations and anions

CO2 Can eliminate the interfering anions from the given mixture.

CO3 Prepare alums and complexes .

SEMESTER VI

Course Code: CHE6B18(Pr) Core Course XVIII: PROJECT WORK Total Hours: 36; Credits: 2; Hours/Week: 2 (Semester V)

CO1 Students express their creativity and develop higher order thinking skills.

CO2 Team work gives more innovative ideas.

CO3 Learn to prepare power point presentation.

CO4 Develops an aptitude for doing research.

CO5 Gets preliminary ideas for writing a thesis.

CO6 For analysis and interpretation of data they will use more resources.

SEMESTER I

Course Code: CHE1C01 Complementary Course I: GENERAL CHEMISTRY Total Hours: 36; Credits: 2; Hours/Week: 2

CO1 Explain the periodic properties of elements, mole concept and define the different terms used for expressing concentration of solutions

CO2 Give the theory behind the qualitative and quantitative analysis conducted in the laboratory ‘

CO3 Write down the electronic configuration of elements applying Hunds rule,Aufbau Principle and Paui’s exclusion principle .

CO4 Apply VSEPR theory in predicting the shape and bond angles to the molecules

CO5 Explain the different types of hybrididsation using suitable examples.

CO6 Explain Group displacement law, n/p ratio and stability of radio active elements

CO7 Define Isotopes, isobars and isotones with suitable examples

CO8 Explain Nuclear fission and nuclear fusion reactions with examples

CO9 Determine the age of rocks and fossils by ^{14}C –dating .

CO10 Biochemistry of iron, Zinc and Cobalt

SEMESTER II

Course Code: CHE2C02 Complementary Course II: PHYSICAL CHEMISTRY Total Hours: 36; Credits: 2; Hours/Week: 2

SEMESTER III

Course Code: CHE3C03 Complementary Course III: ORGANIC CHEMISTRY Total Hours: 54; Credits: 2; Hours/Week: 3

CO1. Explain cyclic structures of glucose

CO2. Discuss primary, secondary and tertiary structure of proteins

CO3. Write down Saponification number

CO4. Discuss the structure of nucleoside

CO5. Explain Double-helical structure of DNA

CO6. Describe DNA fingerprinting

CO7. Define denaturation of proteins

CO8. Write down the classification of Amino acids.

CO9. Define hydrogenation of oils.

CO10. Explain Zwitter ion formation

SEMESTER IV

Course Code: CHE4C04 Complementary Course IV: PHYSICAL AND APPLIED CHEMISTRY Total Hours: 54; Credits: 2; Hours/Week: 3

CO1. Define octane number.

CO2. Explain theories of colour and chemical constitution of dyes.

CO3. Describe composition and health effects of toothpaste.

CO4. Draw the structure of Ajinomoto.

CO5. Write down commonly used permitted colours and non permitted food colours.

CO6. Explain artificial ripening of fruits.

CO7. Define herbicides.

CO8. Draw the structure of Endosulphan and DDT.

CO9. Explain the manufacture of cement

CO10. Describe different types of glasses

SEMESTER IV

Course Code: CHE4C05(P) Complementary Course V: CHEMISTRY PRACTICAL Total Hours: 144; Credits: 4; Hours/Week: 2 (I, II, III & IV Semesters)

PG

Programme Specific Outcome

PSO1 Provide theoretical background and develop practical skills for analysing materials using modern analytical methods and instruments,

PSO2 Inculcate a problem solving approach by coordinating the different branches of chemistry

PSO3 Becomes professionally skilled for higher studies in research institutions and to work in chemical industries.

PSO4 In-depth knowledge helps to qualify in competitive exams.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER I

CH1CO1 - QUANTUM CHEMISTRY AND GROUP THEORY (3Credits, 54 hrs)

CO1. Define abelian and cyclic groups.

CO2. Explain similarity transformation

CO3. Describe addition and multiplication of matrices.

CO4. Explain construction of IR by reduction.

CO5. Elaborate great orthogonality theorem.

CO6. write down construction of character table of C2v point group.

CO7. Describe derivation of reduction formula using GOT

CO8. Explain the relation between group theory and quantum mechanics.

CO9. Write down the group multiplication table of C3v

CO10. Explain molecular symmetry.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER I

CH1CO2 - ELEMENTARY INORGANIC CHEMISTRY (3 Credits, 54hrs)

CO1 Explain different acid base theories

CO2 Classification of acids and bases as hard and soft.

CO3 Chemistry of non aqueous solvents

CO4 -Preparation, reactions, structure and bonding of electron deficient compounds

CO5 Calculate the Styx numbers of closo, nido, arachno polyhedral structures.

CO6 Synthesis, structure, bonding and uses of Phosphorous-Nitrogen, Phosphorous - Sulphur and Sulphur-Nitrogen compounds

CO7 Structure of Zeolites and use of Zeolites as molecular sieves.

CO7 Heteropoly and isopoly anions of W, Mo, V.

CO8 Diagrammatic representations of standard reduction potentials using Ellingham diagram. Latimer and Frost diagrams. Pourbaix diagram

CO9 Nuclear fission, fusion and Radiation Chemistry .

CO10 Concept of molecular structure and bonding

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER I

CH1CO3 - STRUCTURE AND REACTIVITY OF ORGANIC COMPOUNDS

(3 Credits, 54hrs)

CO1 Describe the different types of bonding in organic compounds

CO2 Describe reaction mechanism of organic reactions and variousreaction intermediates

CO3 Explain the conformation of ethane,n-butane, glycols, cyclohydrin

CO4 Conformational analysis of 1,4 cis and trans disubstituted cyclohexane

CO5 Write down the conformation of decaline,adamantine, sucrose and lactose

CO6 Explain the effect of conformation on the course and rate of reactions in 1. Debromination of dl and meso 2,3 dibromo butane using KI. 2. Semipinacolic deamnation of Erythro and threo 1,2 diphenyl 1-(p-chloro phenyl)-2 amino ethanol

CO7 Compare the rate of esterification of methanol, isomenthol,neo menthol and neo iso menthol

CO8 Explain optical isomerism of compounds that do not contain an asymmetric carbon atom.

CO9 Explain the chiral pool synthesis of beetle pheromone component (S) –(-) ipsenol from (S) –(-) leucine

CO10 Describe substrate controlled asymmetric synthesis , chiral auxillary controlled asymmetric synrthesis ,chiral reagent controlled asymmetric synthesis and asymmetric aldol reaction.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER I

CH1CO4 – THERMODYNAMICS, KINETICS AND CATALYSIS (3 Credits, 54hrs)

CO1 Describe Nernst heat theorem

CO2 Derive Duhem –Margules equation and explain its application

CO3 Explain Onsager reciprocal relation

CO4 Derive Glansdorf-Pregogine equation

CO5 Explain Rice-Herzfeld mechanism and steady state approximation

CO6 Explain the kinetics of fast reactions

CO7 Explain Principle of crossed molecular beams

CO8 Explain theory of uniolecular reaction

CO9 Derive BET equation

CO10 Explain Langmuirs uni molecular theory of adsorption

CO11 Explain Michaelis- Menten mechanism

CO12 Explain Eley-Rideal mechanism

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER II

CH2CO5 - APPLICATIONS OF QUANTUM MECHANICS AND GROUP THEORY (3 Credits, 54hrs)

CO1. Write down selection rules for IR and Raman activities.

CO2. Define direct product.

CO3. Explain spectral transition probabilities.

CO4. Write down Laporte selection rule.

CO5. Explain the hybridisation in CH4.

CO6. Describe construction of SALC using projection operator.

CO7. Define vanishing integrals.

CO8. Classify atomic orbitals involved into symmetry species.

CO9. Explain IR and Raman active modes of H2O.

CO10. Describe inverse transformation.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER II

CH2CO6 - CO-ORDINATION CHEMISTRY (3Credits, 54hrs)

CO1. Explain classification of redox reaction mechanism.

CO2. Describe outer sphere mechanism.

CO3. Write down Marcus equation

CO4. Explain the effect of the bridging ligand

CO5. Define Prompt and delayed reactions.

CO6. Describe the prediction of substitution lability by Adamson's rules.

CO7. Define Photoaquation.

CO8. Explain photo isomerisation.

CO9. Describe water photolysis.

CO10. Explain the methods for distinguishing between outer and inner sphere redox reactions

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER II

CH2CO7 - REACTION MECHANISM IN ORGANIC CHEMISTRY (3Credits, 54hrs)

CO1 To understand aliphatic and aromatic, nucleophilic and electrophilic substitution with mechanism and kinetics

CO2 To develop an ability to understand addition and elimination reactions with mechanism and stereochemical aspect

CO3 To understand the competition between substitution and elimination reactions according to the conditions of reagents and substrate

CO4 Students will be able to understand all the nucleophilic condensations reactions of carbonyl compounds

CO5 To impart the students in depth knowledge about the basic concepts and theory of pericyclic reactions and to get an idea about the orbital overlap in chemical reaction

CO6 To enable the students to acquire proper knowledge about photochemical reactions with mechanism

CO7 The students will be able to understand acyl-oxygen and alkyl-oxygen bond fission in ester hydrolysis according to the conditions.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER II

CH2CO8 - ELECTROCHEMISTRY, SOLID STATE CHEMISTRY AND STATISTICAL THERMODYNAMICS (3 Credits, 54hrs)

CO1 Describe Debye –Huckel equation , limiting and extended forms

CO2 Calculate effect of ionic strength on ion reaction rates

CO3 Compare the efficiency of electro chemical cells with heat engines

CO4 Explain the advantages and limitations of lead-acid, Ni-Cd and Ni-MH cells.

CO5 State the different theories of Hydrogen over voltage

CO6 Explain Polarography and dropping mercury electrode

CO7 Explain symmetry elements, symmetry operations and crystal systems

CO8 Derive Braggs equation and explain the applications

CO9 Explain the stoichiometric and non stoichiometric defects in crystals.

CO10 Explain Maxwell Boltzman statistics

CO11 Explain classical and quantum theories of heat capacities of solids and Einstein's theory of atomic crystals.

CO12 Explain the relationship between Maxwell-Boltzman, Bose-Einstein and Fermi Dirac statistics.

M.Sc. CHEMISTRY – SEMESTER I & II

CH1PO1 & CH2PO4 – INORGANIC CHEMISTRY PRACTICALS– I & II

(4 Credits)

CO1 An ability to analyse the cation mixture

CO2 1Ability to estimate the ions by complexometric titrations

CO3 Ability to find out intensity of colour using colorimetric methods

M.Sc. CHEMISTRY – SEMESTER I & II

CH1PO2 & CH2PO5 – ORGANIC CHEMISTRY PRACTICALS– I & II

(4 Credits)

CO1 An ability to separate the mixture of organic compounds
CO2. An ability to analyse the compounds separated from the mixture by chemical analysis
CO3 Ability to find out the melting and boiling points of the compounds
CO4 Ability to prepare organic compounds by two or three steps

M.Sc. CHEMISTRY – SEMESTER I & II

CH1PO3 & CH2PO6 – PHYSICAL CHEMISTRY – I & II (4 Credits)

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER III

CH3CO9 - MOLECULAR SPECTROSCOPY (3 Credits, 54hrs)

CO1 To impart the students in depth knowledge about the basic concepts and theories of microwave spectroscopy, IR, Raman, NMR and electronic spectroscopy

CO2 The students will be able to understand NOE in NMR, FT-IR, 2D NMR COSY spectrum

CO3 An ability to calculate UV λ_{max} value of compounds

CO4 To develop an ability to analyse spectrum and find out the correct structure of compounds as an application of spectroscopy

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER III

CH3CO10 - ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY (3Credits, 54h)

CO1. Write down bulk and trace metal ions.

CO2. Explain sodium/potassium pump

CO3. Describe storage and transport of metal ions.

CO4. Explain oxygen transport by hemoglobin

CO5. Discuss the structure of hemerythrin.

CO6. Explain Cytochrome P-450.

CO7. Write down Photosystem I and II.

CO8. Explain nitrogen fixation.

CO9. Explain anti cancer drugs.

CO10. Discuss Lewis acid role of Zn(II) and Mn(II) containing enzymes.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER III

CH3CO11 - REAGENTS AND TRANSFORMATIONS IN ORGANIC CHEMISTRY

(3Credts, 54hrs)

1. To enable the students to acquire proper knowledge about various methods of oxidation and reduction reagents
2. An ability to apply synthetic reagents like DABCO, DMAP, DDQ, oxane etc in organic synthesis
3. The students will be able to understand different types of classification of polymers and sequence determination structure and synthesis of bio-polymers like proteins, nucleic acids, cellulose, starch etc.
4. To impart the students in depth knowledge about the heterocyclic compounds for different elements containing heterocyclic ring
5. To impart the students in depth knowledge about the molecular rearrangements with mechanism

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER III

CH3E01 - SYNTHETIC ORGANIC CHEMISTRY (3 Credits, 54hrs)

CO1 To enable the students to acquire proper knowledge for various oxidation and reduction methods
CO2 Ability to apply organometallic and metallic reagents for synthesis of organic compounds
CO3 To impart depth knowledge about palladium catalyzed coupling reactions including mechanism and synthetic application
CO4 Students will be able to synthesize an organic compound by retrosynthetic methods by C-C and C-X bond disconnection
CO5. Synthetic study of most of the heterocyclic compounds probably medicinally important
CO6 Students will be able to understand all the nucleophilic condensation reactions of carbonyl compounds and apply it on the retrosynthetic analysis
CO7 Students will be able to synthesize stereo and regioselective compounds by own planning, target selection reagents and solvents

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER IV

CH4C12 ADVANCED TOPICS IN CHEMISTRY (4Credits, 72hrs)

CO1 Application of nanotechnology in sunscreen, cosmetics, food products, food packing, clothing and house hold appliances

CO2 Application of nano technology in nanomedicines , in a variety of industrial and purification process

CO3 Study of Green chemistry helps to reduce the damage of the environment caused by man made materials .

CO4 Methods for reducing waste to disposing waste in the correct manner.

CO5 Explain green chemistry principles

CO6 Explain physic chemical properties of drugs and their pharmacologic activity

CO7 Explain the factors governing drug design

CO8 Explain Haughton's tea bag procedure.

CO9 Explain TPD method for determination of surface acidity

CO10 Explain the principle of solar cells

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER IV

CH4C13- INSTRUMENTAL METHODS OF ANALYSIS (4 Credits, 72 hrs)

CO1 Explain absolute and relative errors , mean and standard deviation ,variance, confidence limits, student t and f tests

CO2 Explain the principles of gravimetry and inorganic precipitating agents like NH_3,H_2S, $(NH_4)_2$ MoO_4 and NH_4SCN.

CO3 Describe organic precipitating agents , acid base redox and precipitation titrations, and complexometric titrations

CO4 Explain the electroanalytical methods like potentiometry, polarography their applications biomembrane, biological and biocatalytic electrodes.

CO5 Describe Amperometry,Coulometry, chronopotentiometry, Anodic stripping voltametry

CO6 State the fundamental laws of spectrophotometry,nephelometry,turbidometry and fluorimetry.

CO7 Explain atomic emission spectrometry,excitation sources like flame, AC and DC arc, instrumentation and qualitative and quantitative analysis.

CO8 Explain the theory, instrumentation and applications of atomic fluorescence spectrometry, X ray absorption and X-raty diffraction methods

CO9 Describe photo electron spectroscopy, Auger, ESCA, SEM,TEM,AFM

CO10 Explain TG,DTA,DSC and their instrumentation

CO11 Explain different chromatographic methods, detectors and CHN analysis by GC.

M.Sc. CHEMISTRY (CSS PATTERN) - SEMESTER IV

CH4EO5 - INDUSTRIAL CATALYSIS (ELECTIVE) (4 Credits, 72hrs)

CO1 Explain Physisorption and chemisorptions

CO2 Kinetics of heterogeneous catalysis

CO3 Explain Langmuir, BET and Freundlich isotherms

CO3 Explain the different methods for the preparation of catalysts and deactivation of catalysts

CO4 Describe the general methods of synthesis of zeolites, mechanism of nuclear formation and crystal growth, structure of zeolites

CO5 Expain the basic principles of phase transfer catalyzed reactions

CO6 Biocatalysts and their immobilization

CO6 Catalysts used in industries for obtaining hydrocarbons from synthesis gas; Fisher-Tropsch process, Mobil process for conversion of methanol to gasoline hydrocarbons.

CO7 Catalysts used for environmental protection

CO8 Explain the reactions involved in the Hydroformylation of olefins, carbonylation of organic substrates, conversion of methanol to acetic acid

CO9 Explain the role of catalysts in the synthesis of vinyl acetate and acetic anhydride, palladium catalyzed oxidation of ethylene, acrylonitrile synthesis,

CO10 Role of Zeigler-Natta catalysts in producing stereo regular polymers.

M.Sc. CHEMISTRY – SEMESTER III & IV

CH3PO7 & CH4P10 – INORGANIC CHEMISTRY PRACTICALS– III & IV (4 Credits)

CO 1Ability to quantitatively separate binary mixtures of ions in solution and estimation by volumetric, colorimetric or gravimetric methods

CO2 Ability to separate binary mixtures by ion-exchange method

CO3 Ability to prepare inorganic complexes

M.Sc. CHEMISTRY – SEMESTER III & IV

CH3PO8 & CH4P11 – ORGANIC CHEMISTRY PRACTICALS– III & IV (4 Credits)

1. **M.Sc. CHEMISTRY – SEMESTER III & IV**
2. Students can expertise the estimation of reducing sugar, amino group, phenolic group and esters volumetrically
3. Students can expertise the estimation of vitamin A, drugs and anti-biotics colorimetrically
4. Students will expertise the extraction of natural products and purification by column and TLC
5. Students can expertise preparation of TLC plate activation and identification of compounds-dyes, food additives, food colours, amino acids, sugars, pesticides and herbicides

CH3PO9 & CH4P12 – PHYSICAL CHEMISTRY PRACTICALS– III & IV (4 Credits)

CH4PrO1 Research Project

CH4VO2 Viva voce