

MASTER OF SCIENCE (M. Sc – Chemistry)

Programme Code: MSC-04PGR002

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

- The objective of the Master's programme in chemistry is to equip the students to apply the knowledge of mechanisms of chemical processes in living and non-living systems and higher order techniques to applied aspects.
- The laboratory training in addition to theory is included to prepare the students and learners for their careers in the industry and applied research where chemical sciences is increasingly elevated with an area of wisdom.
- The objective of the program is also to train the students and also sensitize them to the scope for research towards basics and current updates.
- The objective of the programme is also to address the increasing need for skilled scientific manpower with an understanding of research ethics involving chemistry for humans to contribute to the application, advancements and impartment of knowledge in the field of chemical sciences globally.

PROGRAM OUTCOMES (PO's)

- **[PO.1.] Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking & actions.
- **[PO.2.] Effective communication:** Speak, read, write & listen clearly in person and through electronic media in English and in one Indian Language, and make meaning of the world by connecting people, ideas, books, media and technology.
- **[PO.3.] Social interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings.
- **[PO.4.] Effective citizenship:** Demonstrate empathetic social concern and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
- **[PO.5.] Ethics:** recognize different value systems including your own, understand the moral dimensions of decisions and accept the responsibility for them.
- **[PO.6.] Environment and sustainability:** Understand the issues of environmental contents and sustainable development.
- **[PO.7.] Self-directed and long-life learning:** Acquire the ability to engage in independent and life long learning in the broadest context of socio-economic and socio technological changes & develop an aptitude for continuous learning and professional development with ability to engage in chemistry practices and education program.
- **[PO.8.] Knowledge:** Provide basic knowledge for understanding the principles and their applications in the area of Chemical Sciences, Instrumentation & Chemical Technology.
- **[PO.9.] Technical Skills:** Develop an ability to use various instruments and equipment with an indepth knowledge on standard operating procedures for the same.

- **[PO.10.] Research & Development:** To Demonstrate knowledge of identifying a problem, critical thinking, analysis and provide rational solutions in different disciplines of Chemistry & Chemical Sciences.
- **[PO.11.] Modern Tool Usage:** Develop appropriate technique, resources and IT tools for prediction and modelling to complex chemical issues.
- **[PO.12.] The Society:** Apply regional chemical reasoning informed by the contextual knowledge to comprehend and receive instructions on chemical safety and the consequent responsibilities relevant to the society as well as social well being.
- **[PO.13.]** Problem analysis
- **[PO.14.]** Conduct investigations of complex problems
- **[PO.15.]** Design/Development of Solutions
- **[PO.16.]** Individual and Teamwork

PROGRAM SPECIFIC OUTCOMES (PSO's)

- **[PSO.1.]** Develop knowledge, understanding and expertise in their chosen field of chemical science.
- **[PSO.2.]** Develop an understanding of eco-friendly chemical process and impact of chemistry on health and environment.
- **[PSO.3.]** Understand the theoretical concepts of instruments that are commonly used in most chemistry fields as well as interpret and use data generated in the instrumental chemical analysis.
- **[PSO.4.]** Provide opportunities to excel in academics, research or industry.

Course Code: 6SMCH101

Course Name: Inorganic Chemistry – I

Course Objective

The student will be able to

- Explain rules of periodicity
- Identify s,p,d,f block elements
- Provide brief descriptions of the transition elements
- Understand Chemical Bonding and structure
- Explain Bioinorganic Chemistry
- Analyze Character of covalent bonds.

Course Outcomes

After the completion of course learner should able to understand about

- Be able to describe the electronic structure of atoms
- Be able to know the properties of elements in the periodic table

- Be able to differentiate between types of bonds & structures
- Be able to determine shapes of molecules
- Knowledge of properties and behavior

Course Code: 6SMCH102

Course Name: Organic Chemistry – I

Course Objective

The student will be able to

- Explain rules of organic Reaction Mechanism
- Identify Carbon–Carbon Multiple Bonds
- Provide brief descriptions of the Elimination Reactions
- Understand Stereochemistry & their rules
- Explain Concept of Chirality
- Analyze Characteristics of symmetry.

Course Outcomes

- Be able to describe the transition states and intermediates
- Be able to know the properties of Aromatic Electrophilic Substitutions
- Be able to differentiate organic reactions
- Be able to determine molecular Chirality
- Knowledge of properties of Carbon–Carbon Multiple Bonds.

Course Code: 6SMCH103

Course Name: PHYSICAL CHEMISTRY-I

Course Objective

The student will be able to

- Explain rules of THERMODYNAMICS
- Identify Ideal & Non ideal solutions
- Provide brief descriptions of the KINETIC THEORY OF GASES
- Understand Molecular statistics
- Explain Concept of Molecular collision in gases
- Analyze Characteristics COLLOIDS AND MACROMOLECULES
- Define phase rules.

Course Outcomes

After the completion of course learner should be able to understand the following:

- Be able to describe the Phase rule & Solid-Liquid Equilibria

- Be able to know the properties of COLLOIDS AND MACROMOLECULES
- Be able to differentiate polymerisation
- Be able to determine Postulates of kinetic theory of gases
- Knowledge of Chemistry of polymerization
- Know methods of determining molecular weights.
- Be able to understand kinetics of gases.

Course Code: 6SMCH104

Course Name: Analytical Chemistry - I

Course Objective

The student will be able to

- Determine Errors and treatment of Analytical Chemistry
- Learn Chromatographic methods
- Provide brief descriptions of Electro analytical Techniques
- Understand Volumetric and Gravimetric Analysis
- Explain Concept of TLC
- Analyze Characteristics of Standard solutions Indicators
- Define organic precipitation.

Course Outcomes

- Be able to describe use of Computer in analytical chemistry.
- Be able to know the properties of Mixture and their analysis
- Be able to differentiate Volumetric and Gravimetric Analysis
- Be able to determine Solvent systems and their detection methods
- Knowledge of Errors and their treatment
- Know methods of sampling.

Course Code: SMCH 101

Course Name: Lab-I Inorganic chemistry

Course Objective

- To analyze the preparation, properties of inorganic compound. Estimation of inorganic salts mixture containing interfering radicals

Course Outcome

- Estimation of various ions by qualitative methods.
- Preparation of some inorganic complex compounds

Course Code: SMCH 103

Course Name: Lab-II Physical Chemistry

Course Objective

- To study about adsorption, chemical kinetics, conductometry, Polarimetry and colorimetry

Course Outcomes

After the completion of course learner should able to understand the following:

- Verification of Freundlich's Adsorption Isotherm.
- Determination of order of a reaction.
- Determination of solubility, dissociation constant and ionic strength.
- Rate constant
- Partition co-efficient
- Verification of Lambert beer Law.

Course Code: 6SMCH201

Course Name: INORGANIC CHEMISTRY-II

Course Objective

The student will be able to

- Explain Chemistry of non – Transition elements
- Define Organometallic chemistry principles
- Know Metal – ligand equilibria in solution
- Define applications of Lanthanides and Actinides
- Explain Non- aqueous solvents
- Understand Nuclear and radiochemistry.

Course Outcomes

After the completion of course learner should able to understand about

- Be able to describe properties of the non – transition elements
- Be able to know the properties of Metal – ligand bonding
- Be able to Know Nuclear and radiochemistry
- Be able to define fission and fusion
- Knowledge of Synthesis, properties and structure of ligand complexes.

Course Code: 6SMCH202

Course Name: ORGANIC CHEMISTRY-II

Course Objective

The student will be able to

- Explain Mechanism of reactions
- Define Alkylation and Acylation
- Study of Organometallic compounds
- Define Methodologies in organic synthesis
- Explain carbonyl compounds

Course Outcomes

- Be able to describe reaction involving enolates
- Be able to know the properties of Alkylation and Acylation reactions
- Be able to Know Oxidation
- Be able to define synthones and retrones
- Be able to know carbonyl compounds.

Course Code: 6SMCH203

Course Name: PHYSICAL CHEMISTRY-II

Course Objective

The student will be able to

- Explain principles of Photochemistry
- Define Photo physical phenomena
- Understand Arrhenius theory of electrolytic dissociation
- Define kinetics of a reaction
- Explain Experimental methods of reactions
- Calculate order of a reaction
- Know Electrochemical cells.

Course Outcomes:

- Be able to describe photodissociation
- Be able to know photophysical pathways of excited molecular system
- Be able to Know Electrochemical cells with and without transference

Course Code: 6SMCH204

Course Name: ANALYTICAL CHEMISTRY-II

Course Objective

The student will be able to

- Explain principles of Ultraviolet and visible spectrophotometry
- Define Infrared Spectroscopy
- Understand Nuclear Magnetic Resonance (NMR)
- Define Mass spectroscopy and their applications
- Explain difference between AAS and FES
- Learn principles & applications of various spectrophotometers

Course Outcomes

- Be able to describe Ultraviolet and visible spectrophotometry
- Be able to know Infrared Spectroscopy
- Be able to Know Nuclear Magnetic Resonance (NMR)
- Be able to define Nephelometry and Turbidometry
- Be able to know Inductively coupled Plasma Spectroscopy

Course Code: 6SMCH205

Course Name: LAB-I ORGANIC CHEMISTRY

Course Objective

- The aim of this course is to provide the knowledge of basic and advanced laboratory procedures used in Qualitative and quantitative analysis in organic chemistry

Course Outcomes

- Students will gain an understanding of analysis of binary mixture, estimation of functional group, organic synthesis including spectroscopic and analytical techniques for identification and characterization.

Course Code: 6SMCH206

Course Name: LAB-II ANALYTICAL CHEMISTRY

Course Objective

- To perform quantitative analysis of Ores/alloys along with the determination of complex composition and separation of different metal ions using ion-exchange method.

Course Outcome

- Determination of complex composition and stability constant of a complex by Job's method spectro - photometrically

- Determination of DO, COD BOD Hardness of water sample.
- Determination of total cation concentration and separation of different metal ions using cation exchange resin.
- To separated cation and anion by Chromatography.
- Determination of half-cell potential of Cd(II) ion in KCl solution and estimation of Cd(II) ion in unknown solution by polarography.

Course Code: 6SMCH301

Course Name: APPLICATION OF SPECTROSCOPY

Course Objective

The student will be able to

- Explain Symmetry and Group theory in Chemistry
- Define Microwave Spectroscopy
- Understand Infrared-Spectroscopy
- Define Classical and quantum theories of Raman effect
- Explain Basic principles of photo-electric effect
- Learn principles & applications of various spectroscopies.

Course Outcome

After the completion of course learner should able to understand the following:

- Be able to Calculate C_{2v} and C_{3v} point group
- Be able to Draw representations of groups by matrices
- Be able to Know rigid rotor models
- Be able to define P.Q.R. branches
- Be able to know Resonance Raman spectroscopy
- Be able to define Emission spectra's

Course Code: 6SMCH302

Course Name: BIO ORGANIC& BIO-INORGANIC CHEMISTRY

Course Objective

The student will be able to

- Explain Cell Structure and Functions
- Define Amino acids, Peptides and Proteins
- Understand Nucleic Acids
- Know Metals in Life Processes
- Explain Basic principles of Trace Metals in Plant Life
- Learn mechanism & applications of various enzymes

Course Outcomes

After the completion of course learner should able to understand the following:

- Be able to understand Trace Metals in Plant Life
- Be able to Know nitrogen cycle
- Be able to Know Metals in Life Processes
- Be able to define Nucleic Acids
- Be able to know Amino acid metabolism
- Be able to define Cell Structure and Functions

Course Code: 6SMCH303

Course Name: DISCIPLINE SPECIFIC ELECTIVE -I APPLIED ORGANIC CHEMISTRY

Course Objective

The student will be able to

- Explain Agrochemicals and their synthesis
- Define Manufacture of Phenylethanol, detergents, vanillin and other food flavours, synthetic musk
- Understand Dyes and Intermediates
- Know Mechanism of polymerization
- Explain Basic principles of Soap and detergents
- Learn Starch and cellulose

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand Soap and detergents
- Be able to Know Polymers
- Be able to Know Synthesis of dyes intermediates
- Be able to define Manufacture of Acetic acid and butenaldehyde
- Be able to know Plant growth regulators
- Be able to define Jovenileharmones.
- Be able to define azo dyes.

Course Code: 6SMCH304

Course Name: DISCIPLINE SPECIFIC ELECTIVE-II DRUG & HETEROCYCLIC COMPOUNDS

Course Objective

The student will be able to

- Know mechanism of Drug design
- Define History and development of QSAR
- Understand Antimalerials
- Know Anti AIDS drugs
- Explain Small ring Heterocycles
- Learn Antibiotics
- Understand Six membered Heterocycles.

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand Six membered Heterocycles
- Be able to Know Benzo fused five membered Heterocycles
- Be able to Know Synthesis of Cardiovascular drugs
- Be able to define Antihistamines, Anaesthetics, Anti- inflammatory drugs
- Be able to know Drug design
- Be able to define Anti AIDS, Cardiovascular synthesis of drugs
- Be able to understand oxepines & thiepines.

Course Code: 6SMCH305

Course Name: INORGANIC CHEMISTRY (ELECTIVE PAPER-I) CHEMISTRY OF INORGANIC MATERIALS

Course Objective

The student will be able to

- Know Lattice Defects: point defects, Line defect and plane defect
- Define Synthesis of Inorganic materials
- Understand Ionic Conductors, Organic semiconductors
- Know order & disorder phenomena
- Explain Magnetic properties of Materials
- Learn Synthesis of Inorganic materials
- Understand Metal and Alloys.

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand Lattice defects.
- Be able to Know synthesis inorganic material.
- Be able to differentiate nanocomposites, Thin films, nanofoam, nanoclusters.
- Be able to understand susceptibility of solids.
- Be able to Define Organic semiconductors.
- Be able to understand high pressure synthesis

- Be able to know Magnetic Materials.

Course Code: 6SMCH306

Course Name: DISCIPLINE SPECIFIC ELECTIVE-II COORDINATION CHEMISTRY

Course Objective

The student will be able to

- Know Mixed Ligand complexes
- Define Transition metal complexes & catalysis.
- Understand Magneto Chemistry
- Know magnetic & thermal properties
- Explain Theories of Metal-Ligand bonding

Course Outcomes

- Be able to understand Mixed Ligand complexes.
- Be able to Know ternary complexes.
- Be able to differentiate nanocomposites, Thin films, nanofoam, nanoclusters.
- Be able to understand peptide synthesis & hydrolysis.
- Be able to Define Magnetic behavior of complexes.
- Be able to know theories of bonding, VBT, CFT, LFT and MOT.

Course Code: 6SMCH307

Course Name: DISCIPLINE SPECIFIC ELECTIVE-I ADVANCED CHEMICAL KINETICS

Course Objective

The student will be able to

- Know Steady State Approximation
- Understand Electron transfer reaction
- Know Catalysis
- Explain cooperative and pseudo-phase ion exchange models
- Learn Catalysis, Induced and cooxidations
- Understand Mechanism of chromium (VI) oxidations

Course Outcomes

Course completion give rise to the following outcomes

- Be able to understand collision frequency
- Be able to Know interpretation of hydrogen ion effect
- Be able to differentiate Mechanism of chromium(VI) oxidations
- Be able to understand Induced and cooxidations

- Be able to Define Micellar catalysis
- Be able to understand Westheimer mechanism and its validity

Course Code: 6SMCH 308

Course Name: DISCIPLINE SPECIFIC ELECTIVE-II ELECTROCHEMISTRY

Course Objective

The student will be able to

- Know Electrolytic conductance
- Define activity coefficients and their interrelationship
- Understand Ion solvent interactions
- Know Polarization
- Explain Diffusion over potentials
- Learn Electroanalytical Methods
- Understand Colorimetric titrations

Course Outcomes

Course completion give rise to the following outcomes

- Be able to understand Polarization
- Be able to Know Electroanalytical Methods
- Be able to differentiate Redox and precipitation titrations
- Be able to understand electro-capillary
- Be able to Define Electrode reactions
- Be able to understand. Zeta potentials
- Be able to know Debye-Huckel limiting law

Course Code: 6SMCH309

Course Name: Lab I (Lab General)

Course Objective

- To perform Instrumental methods and Analytical Technique related to spectrophotometric determination

Course Outcome

- Students will able to determine heavy metals spectrophotometrically.
- Students will able to understand about Separation& determination of two metal ions: Cu-Ni, Zn-Ni,Mg-Ni involving volumetric & gravimetric method.

Course Code: 6SMCH310

Course Name: Lab II (LAB SPECIAL ORGANIC CHEMISTRY)

Course Objectives

To prepare organic compounds which has its application in various industries

Course Outcome

- Be able to understand Soap and detergents
- Be able to Know Polymers
- Be able to Know Synthesis of dyes intermediates
- Be able to define Manufacture of Acetic acid and butenaldehyde
- Be able to know Plant growth regulators
- Be able to define Jovenile harmones.
- Be able to define azo dyes.

Course Code: 6SMCH311

Course Name: LAB II (LAB SPECIAL INORGANIC CHEMISTRY)

Course Objectives

- To prepare inorganic compounds which has its application in various industries

Course Outcomes

- Students will able to synthesise inorganic compounds.
- Students will able to study metal in different alloy
- Students will able to determine magnetism in different compounds

Course Code: 6SMCH312

Course Name: Lab II (LAB SPECIAL PHYSICAL CHEMISTRY)

Course Objective

- To determination of sample by Conductometric, Colorimetric. pH metric and Potentiometric method

Course Outcome

- Students will able to understand Conductometric Analysis.
- Students will able to understand Colorimetric analysis
- Students will able to understand pH metric and Potentiometric techniques

Course Code: 6SMCH401

Course Name: DISCIPLINE SPECIFIC ELECTIVE-III CHEMISTRY OF NATURAL PRODUCTS

Course Objective

- Know Terpenoids
- Define Alkaloids
- Understand Prostaglandins
- Explain carbohydrates and proteins
- Learn Synthesis and structure of biotin and vitamin B2
- Understand biological functions of B6

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand synthesis of vitamin B1
- Be able to Know Terpenoids Structure and synthesis of abietic acid
- Be able to differentiate Biogenesis
- Be able to Define Occurrence, nomenclature, classification, biogenesis and physiological effects
- Be able to understand Testosterone, Estrone, Progesterone.

Course Code: 6SMCH402

Course Name: DISCIPLINE SPECIFIC ELECTIVE-IV STEREOCHEMISTRY

Course Objective

- Know Stereochemistry of Organic Compounds
- Define stereotopicity and enantiomeric excess
- Understand stereoselective and stereospecific reactions
- Know Diels Alder selective synthesis
- Explain Fused and bridged rings: Fused bicyclic ring systems
- Learn Bridged rings, Nomenclature stereochemical restrictions

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand Stereochemistry of Allenes
- Be able to Know Configuration of diastereomers
- Be able to differentiate O.R.D. and C.D
- Be able to understand hydroboration, catalytic hydrogenation via chiral hydrazones
- Be able to Define aspects of the stereochemistry of ring systems

- Be able to explain use of calculations of optical purity and enantiomeric excess.

Course Code: SMCH403

Course Name: DISCIPLINE SPECIFIC ELECTIVE-III SEPARATION SCIENCE

Course Objective

- Know application of diketone
- Define Solvent Extraction Separation
- Understand chromatographic inert support
- Know theory of break through curves
- Explain application of diketone, hydroxyquinoline, oximes
- Learn use of non aqueous solvents in one exchange separation
- Define flow programming chromatography

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand Principles of gas chromatography
- Be able to Know internal electrolysis, electrography
- Be able to differentiate programmed temperature chromatography, flow programming chromatography, gas-solid chromatography
- Be able to understand use of non aqueous solvents in one exchange separation
- Be able to Define application of gas chromatography

Course Code: 6SMCH404

Course Name: DISCIPLINE SPECIFIC ELECTIVE-IV ORGANO METALLIC CHEMISTRY

Course Objective

- Know Methyl derivatives of metals
- Define Catalytic processes of Carbonylation, hydrogenation
- Understand reactions of bimetallic compounds and halides
- Know organometallic reactions with oxygen, carbonyls and others
- Explain isomerisation of olefins
- Learn ,3,4,5,6 and 7 electron donor carbametallic compounds

Course Outcomes

- Be able to understand cleavage of metal carbon bonds, thermochemical consideration
- Be able to Know olefins complexes, addition of metal hydrides to unsaturated carbons
- Be able to differentiate Methods of synthetic chemistry

- Be able to understand aromaticity of cyclopentadienyls
- Be able to Define Mercuration & related covalent metallation reactions of Organometallic compounds with metal salts.

Course Code: 6SMCH405

Course Name: DISCIPLINE SPECIFIC ELECTIVE-III SURFACE CHEMISTRY

Course Objective

- Know Adsorption and surface phenomenon.
- Define Langmuir and B. E. T. equation and significance in surface area determination.
- Understand significance and experimental verification.
- Know micellisation, critical micelle concentration (cmc) thermodynamics of micellisation.
- Explain Types of emulsion, theories of emulsion and emulsion stability.
- Learn Liquid gas and liquid interfaces.
- Understand Solid - Solid interfaces, Surface energy of solids, adhesion and adsorption.

Course Outcomes

After the completion of course learner should be able to understand about

- Be able to understand Gibb's adsorption equation : derivation
- Be able to Know Tammann temperature and its importance,
- Be able to differentiate theories of emulsion and emulsion stability
- Be able to understand sintering and sintering mechanism
- Be able to Define factors affecting cmc, methods of determination of cmc
- Be able to understand Effects of adhesion and adsorption, sintering and sintering mechanism

Course Code: 6SMCH406

Course Name: DISCIPLINE SPECIFIC ELECTIVE-IV CHEMISTRY OF MATERIALS

Course Objective

- Know Ceramic structures, mechanical properties, clay products Reformatories, characterizations
- Define Tc superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials
- Understand stress- strain behavior, Thermal behaviour of polymers.
- Know conducting and ferro -Electric polymers
- Explain Molecular shape, structure and configuration, crystallinity, stress- strain behavior, Thermal behavior, polymer types

Course Outcomes

After the completion of course learner should able to understand about

- Be able to understand Glassy state, glass formers and glass modifiers, applications
- Be able to Know strengthened and particle - reinforced, fibre -reinforced composites
- Be able to differentiate High Tc Materials, pairing and multigap structure in highTc materials
- Be able to understand Thin films and Langmuir- Blodgett Films
- Be able to Define conducting and ferro -Electric polymers
- Be able to understand Effects of optical photon modes, superconducting state
- know applications of applications of high Tc materials.

Course Code: 6SMCH407

Course Name: LAB GENERAL-II

Course Objective

- Determination of various samples by chemical analysis using different methods of volumetric, instrumental, Spectroscopic, classical and Chromatographic techniques along with their applications.

Course Outcomes

After the completion of course learner should able to understand about

- Qualitative Analysis (Titrimetric)
- Colorimetric analysis
- Chromatography techniques.
- Modern Instrumental techniques.

Course Code: 6SMCH408

Course Name: Lab. II (Discipline Specific-Organic Chemistry)

Course Objective

- To synthesize organic compounds via multistep synthesis, and its chacterization techniques.

Course Outcome

- Student will able to synthesize organic compounds.
- Students will able to separate organic compounds using chromatographic technique.
- Student will able to perform Synthesis using microwaves
- Student will able to perform Synthesis using phase transfer catalysis

Course Code: 6SMCH409

Course Name: Lab. II (Discipline Specific-Inorganic Chemistry)

Course Objective

- To perform instrumental, Spectroscopic, classical and Chromatographic techniques along with their applications related to inorganic samples

Course Outcome

- Student will able to understand operation and application of spectrophotometer, flame photometer, pH meter and conductivity meter.
- Students will able to separate mixture cation/anion using chromatographic techniques.

Course Code: 6SMCH410

Course Name: Lab. II (Discipline Specific-Physical Chemistry)

Course Objective

- To perform instrumental determination related to Polarography and DO meter.

Course Outcomes

After the completion of course learner should able to understand the following:

- Estimation in polarography
- Determination of DO in organic solvents

DOCTOR OF PHILOSOPHY (Ph. D – Chemistry)

Programme Code: Ph.D001

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

- The objective of the Doctor of philosophy (Ph.D) programme in chemistry is to equip the scholar to apply the knowledge of mechanisms of chemical processes in living and non-living systems and higher order techniques to applied aspects.
- The laboratory training in addition to theory is included to prepare the scholars for their careers in the industry and applied research where chemical sciences is increasingly elevated with an area of wisdom.
- The objective of the program is also to train the students and also sensitize them to the scope for research towards basics and current updates.
- The objective of the programme is also to address the increasing need for skilled scientific manpower with an understanding of research ethics involving chemistry for humans to contribute to the application, advancements and impartment of knowledge in the field of chemical sciences globally.

PROGRAM OUTCOMES (PO'S)

- **PO1**· Assess the existing knowledge, concepts, techniques, and methodology appropriate to the Scholar's chosen discipline of chemistry.
- **PO2**· Conceive and plan high-quality research and a creative capstone project in the appropriate disciplinary or multi-disciplinary context towards chemical sciences.
- **PO3**· Apply discipline-based and/or cross-discipline-based knowledge to design a problem-solving Strategy
- **PO4**· Identify major issues, debates, or approaches appropriate to the discipline of chemistry.
- **PO5**· Synthesize complex information appropriate to the discipline of chemistry.
- **PO6**· Select and organize credible evidence to support converging arguments of research in chemistry.
- **PO7**· Develop an argument in accordance with the methods of the discipline of chemical sciences.
- **PO8**· Solve discipline-based and/or cross-discipline-based problems using strategies appropriate to the subject.
- **PO9**· Employ writing conventions appropriate to the discipline.
- **PO10**· Exhibit disciplined work habits as an individual.

PROGRAM SPECIFIC OUTCOMES (PSO's)

- **[PSO.1.]** Develop knowledge, understanding and expertise in their chosen field of chemical sciences.

- [PSO.2.] Develop an understanding of eco-friendly chemical process and impact of chemistry on health and environment.
- [PSO.3.] Understand the theoretical concepts of instruments that are commonly used in most chemistry fields as well as interpret and use data generated in the instrumental chemical analysis.
- [PSO.4.] Provide opportunities to excel in academics, research or industry.

Course Code: 5010113101

Course Name: Research Methodology

Course Objective

- The objective is to impart quality and creative research with an in-depth understanding and integrated knowledge of advanced applicable theory in the field of research methodology in chemistry.

Course Outcomes

- To enable for analyzing and identifying problems and provide the appropriate solution to solve the specific problem. It also provides the candidates for better employment required in the academic and non academic field.

Course Code: 5010153101

Course Name: Advanced Instrumentation Techniques

Course Objective

- The objective of imparting quality and creative research with an in-depth understanding and integrated knowledge of advanced applicable theory in the field of Instrumentation Techniques in chemistry.

Course Outcomes

- After completion of this course scholar will able to understand the various advance instrumentation techniques related to research in the field of chemistry.

Course Code: 5010153102

Course Name: (Elective) Phytochemistry

Course Objective

- Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto-constituents from plants.

Course Outcomes

Upon completion of the course, the student shall be able to know the

- Different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery.
- Phytochemical fingerprinting and structure elucidation of phytoconstituents

Course Code: 5010153103

Course Name: (Elective) Environment and green chemistry

Course Objective

- To Study Ecological restorations, Thermo chemical and Photochemical reactions in Atmosphere, Concept and use of bio-fuel and environmental impacts, Scope and principle of Environmental Impact Assessment

Course Outcome

After Completion of the course learner should able to understand following

- About research in green chemistry
- The Environment (Protection) Act, 1986, Hazardous Wastes, Classification of Fossil fuels Global and Indian perspectives; Energy conservation

Course Code: 5010153104

Course Name: (Elective) Chemical Aspects of Nanosciences

Course Objective

- All Scholar have the knowledge of synthesis, characterization and application of nanomaterials.

Course Outcomes

Upon completion of the course, the student shall be able to know the

- Synthesis of various nanomaterials and characterization
- Application of nanomaterials Phytochemical fingerprinting and structure elucidation of phytoconstituents

Course Code: 5010153105

Course Name: (Elective) Chemistry of Industrial Materials

Course Objective

- Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto- constituents.

Course Outcomes

After completion of this course scholar will able to understand

- Chemical Technology
- Industrial emission, liquids and gases
- Removal of Heavy toxic metals

Course Code: 5010113102

Course Name: Research And Publication Ethics

Course Objective

- The objective of the course is to enable M. Phil/Ph.D scholar to understand about the publication ethics and publication misconduct and to create the awareness.

Course Outcome

- After learning this subject scholar will be able to understand the concepts and process of research and aware about the publication ethics and publication misconduct.