

### **Programme Outcome (PO)**

After completing the course students will be able to:

- PO-1 Critically apply theories, methodologies, and knowledge to address fundamental questions in their primary area of study.
- PO-2 Pursue research of significance in the discipline or an interdisciplinary or creative projects.
- PO-3 Demonstrate skills in oral and written communication sufficient to publish and present work in their field and to prepare grant proposals.
- PO-4 Follow the principles of ethics in their field and in academia.
- PO-5 Demonstrate a mastery of skills and knowledge in their discipline and assessment of student learning.
- PO-6 Interact productively with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism.

### **Programme Specific Outcome (PSO)**

Student will:

- PSO-1 Have a thorough knowledge of the literature and a comprehensive understanding of scientific methods and techniques applicable to their own research.
- PSO-2 Be able to demonstrate originality in the application of knowledge, together with a practical understanding of how research and enquiry are used to create and interpret knowledge in their field.
- PSO-3 Have developed the ability to critically evaluate current research and research techniques and methodologies.
- PSO-4 Have self-direction and originality in tackling and solving problems.
- PSO-5 Be able to act autonomously in the planning and implementation of research.
- PSO-6 Have gained oral presentation and scientific writing skills.
- PSO-7 The opportunity to expand the student's knowledge of their research area, including its theoretical foundations and the specific techniques used to study it.

## **Course outcome (CO)**

### **Research Methodology (PHD-101)**

Student will get the knowledge how to

- CO-1 Minimize the risk of injury or illness to laboratory workers by ensuring that they have the training, information, support and equipment needed to work safely in the laboratory.
- CO-2 Demonstrate a basic understanding of computer hardware and software; working knowledge of MS Word, Power Point, Excel and other computer application.
- CO-3 Use chemistry related softwares such as Gaussian, Gaussview and chemdraw.
- CO-4 Use databases such as SciFinder, Scopus and Cambridge structure database.
- CO-5 Use purification techniques such as distillation, fractional distillation, crystallization, fractional crystallisation and chromatography.
- CO-6 Understand data analysis as per IUPAC and association of analytical chemist's (AOAC).
- CO-7 Develop skills for systematic, articulate, and orderly presentation of research work in a written form containing relevant information on the research work carried out.

### **Advanced Inorganic Chemistry (PHD-102A)**

Student will gain the knowledge of:

- CO-1 Fundamental theories and applications of inorganic materials; transition metal complexes, binary and ternary transition metal oxides and main group compounds; structural, magnetic and electronic properties of these families of materials.
- CO-2 Synthesis, structure, properties and reactivity of main group organometallics, organotransition metal chemistry, cluster chemistry, and organo-lanthanoid and -actinoid chemistry.
- CO-3 Coordination Chemistry, Supramolecular Chemistry and Bioinorganic Chemistry.

### **Advanced Organic Chemistry (PHD-102B)**

Students will be able to:

- CO-1 Focus on reactivity and synthesis in organic chemistry; principles and factors governing reactions of organic compounds; application of the concept of green chemistry in organic chemistry for sustainable development; process of drug development in the pharmaceutical industry; application of organic chemistry in medicinal and pharmaceutical chemistry.
- CO-2 Understand applications of Spectroscopy in Structural Identification: IR Spectroscopy, UV Spectroscopy, NMR Spectroscopy and Mass Spectrometry.
- CO-3 Know the convenient method of isolation, structural & stereochemical studies.
- CO-4 Use the reagents in Organic Synthesis (DIBAL and 9-BBN): The construction of complex chemical compounds from simpler ones; process by which many substances important to daily life are obtained. It is applied to all types of chemical compounds, but most syntheses are of organic molecules of DIBAL and 9-BBN.
- CO-5 Understand the Coupling reaction involving Organometallic/Metallic Reagents: Knowledge of variety of reactions where two fragments are joined together with the aid of a metal catalyst.

### **Advanced Physical Chemistry (PHD-102C)**

Students will get the:

- CO-1 Knowledge of Identify oxidizing/reducing agents in chemical reaction. Balance a net redox reaction using the  $\frac{1}{2}$  reaction method in acidic or basic solution. Recognize degrees of reactivity based on an activity series table or a standard reduction potential table.
- CO-2 Knowledge of equations of state for gases, intermolecular forces; the laws of thermodynamics, internal energy and entropy; criteria for equilibrium, free energy; partial molar quantities, the chemical potential; chemical equilibrium in ideal and non-ideal systems; thermodynamics of mixtures; phase equilibria, phase diagrams for systems containing one, and two components; chemical reactions in biological systems.
- CO-3 Scientific knowledge of the rates of chemical reactions, development of mathematical model to describe the rate of reaction and an analysis of the factors that affect reaction mechanisms; phase boundaries and the chemical changes occurring at a surface or interface.