School of Basic and Applied Sciences

Programme Outcomes (POs), Programme Specific Outcomes (PSOs) & Course Outcomes (POs)

Physics (B. Sc.)

Course Outcomes (Cos):

Mechanics

CO1: Students will be able to articulate and describe relative motion. Inertial and non inertial reference frames.

CO2: Students will be able to define the motion of mechanical systems and their degrees of freedom.

CO3: Students will be able to understand the interaction of forces between solids in mechanical systems, centre of mass and inertia tensor of mechanical systems.

CO4: Students will be able to develop analytical approach as tool for problem solving in mechanics

Optics & Vibrations

CO1: Apply knowledge of thermodynamics, sound waves, and light waves to explain natural physical processes and related technological advances.

CO2: Use an understanding of algebraic mathematics along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.

CO3: Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.

CO4: Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.

Mathematical Physics

CO1: The objective of the course is to equip the B.Sc. students with the mathematical techniques that he/she needs for understanding theoretical treatment in different courses taught in thisclass.

CO2: The students will learn important mathematical analysis complex analysis, tensor analysis, group theory etc. needed for understanding theoretical treatment in different courses

Electricity & Magnetism

CO1: Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.

CO2: Use an understanding of calculus along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.

Thermal Physics

CO1: Provide students with a broad understanding and appreciation of the physical principles and laws governing the universe.

CO2: Prepare students for success in their chosen careers by emphasizing critical thinking and scientific reasoning through an inquiry-based curriculum.

CO3: Develop quantitative, analytical and problem-solving skills in majors and non-majors to ensure that students emerging from the coursework/program are equipped with the set of competencies required in Science, Technology, Engineering and Mathematics workplace.

Solid State Physics

CO1: Students should gain basic knowledge of solid state physics.

CO2: The student will:
- be able to account for interatomic forces and bonds
- have a basic knowledge of crystal systems and spatial symmetries
- be able to account for how crystalline materials are studied using diffraction, including concepts like form factor, structure factor, and scattering amplitude.
- know the principles of structure determination by diffraction.
- understand the concept of reciprocal space and be able to use it as a tool
- know the significance of Brillouin zones

Laser Physics

CO1: predict fundamental (and ultimate) characteristics of laser systems based on specific laser materials, such as output power and lasing threshold

CO2: determine the laser behaviour depending on the line broadening mechanism

CO3: Students will gain a significantly enhanced understanding of how lasers work and which types of lasers are most relevant for specific performance specifications and subsequent applications.

Nuclear Physics

CO1: to understand the basic concepts of nuclear physics and express the radioactive decay such as alpha decay, beta decay etc..

CO2: Can explain nuclear reactions, nuclear fusion, nuclear fission.

Atomic & Molecular Physics

CO1: describe the atomic spectra of one and two valance electron atoms.

CO2: explain the change in behavior of atoms in external applied electric and magnetic field.

CO3: explain rotational, vibrational, electronic and Raman spectra of molecules.

CO4 Describe electron spin and nuclear magnetic resonance spectroscopy and their applications..

Particle Physics

CO1: Acquire knowledge in the content areas of particle physics

CO2: Develop and communicate analytical skills in subatomic physics.

CO3: Develop familiarity with particle physics, facilitating informed decisions as students pursue research projects, internships, careers, and graduate study.

CO4: Learn about topics of interest independently, and subsequently organize and present information to each other and to a group, at an appropriate level for their target audience.

Fundamentals of Quantum Mechanics

CO1: Learn the mathematical tools needed to solve quantum mechanics problems.

CO2: Solutions of ordinary and partial differential equations that arise in quantum mechanics will also be studied.

CO3: Build connections between mathematical development and conceptual understanding.

Electronics

CO1: Identify the unique vocabulary associated with electronics and explain the basic concepts of Semiconductor diodes such as pn junction diode, characteristics and ammeters, DC loadline, Zener diode.

CO2: To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers. To solve examples on rectifiers for parameters such as Capacitance, load and source effect, line and load regulations, and circuit current.

CO3: Draw and explain the structure of bipolar junction transistor. Explain the operation of each device in terms of junction bias voltage and charge carrier movement. Identify and explain the various current components in a transistor.

CO4: Describe the application of transistors for Current and voltage amplification. Also to describe the characteristics of different configurations of the transistor. Describe DC load line and bias point. List, explain, and design and analyze the different biasing circuits.

CO5: List and explain the different number system. Solve examples on converting one form of number system to another form. State Boolean laws and theorems. State and explain the different logic gates using truth table. Analyze and design different adder circuits.

Digital Electronics

CO1: Convert different type of codes and number systems which are used in digital communication and computer systems.

CO2: Employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.

CO3: Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.

CO4: Acquire the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

Statistical Mechanics & Thermodynamics

CO1: To acquire working knowledge of the zero-th and first law of thermodynamic

CO2: To acquire working knowledge of the second law of thermodynamics.

CO2: To apply the laws of thermodynamics.

CO4: To link thermodynamics to the micro description used in classical Statistical Mechanics.

CO5: To introduce advanced topics related to Quantum Statistical Mechanics

Computer Simulations in Physics

CO1: Break apart a problem into its component parts.

CO2: Debug computer code that they write.

CO3: Make comparisons between the computer model and the actual physical system.

Astronomy & Astrophysics

CO1: Understand the relation between astronomy and astrophysics.

CO2: Apply principles of physics to astronomical objects.

CO3: Introduce students to the field of astrophysics with mathematically based principles.

Nanotechnology

CO1: Discuss and evaluate state-of-the-art characterization methods for nanomaterials, and determine nanomaterial safety and handling methods required during characterization.

CO2: Explain the fundamental principles of nanotechnology and their application

CO3: Aquire knowledge to identify and compare state-of-the-art nanofabrication methods

Introduction to Microprocessor

CO1: To understand basic architecture of 16 bit and 32 bit microprocessors.

CO2: To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.

CO3: To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors.

CO4: 4. To understand RISC and CISC based microprocessors. 5. To understand concept of multi core processors.

Renewable Sources of Energy

CO1: define basic properties of different renewable sources of energy and technologies for their utilisation,

CO2: describe main elements of technical systems designed for utilisation of renewable sources of energy,

CO3: interpret advantages and disadvantages of different renewable sources of energy

CO4: undertake simple analysis of energy potential of renewable sources of energy,

CO5: explain the correlation between different operational parameters,

CO6: select engineering approach to problem solving when implementing the projects on renewable sources of energy

Higher Mathematical Physics

CO1: The objective of the course is to equip the B.Sc. students with the mathematical techniques that he/she needs for understanding theoretical treatment in different courses taught in this class and for developing a strong background if he/she chooses to pursue research in physics as a career.

CO2: The students will learn important mathematical functions beta, gamma, delta function, complex analysis, tensor analysis and their applications in physics so that he/she needs for understanding theoretical treatment in different courses

Physics (M.Sc.)

Programme Outcomes (Pos):

PO1: This program is designed to enhance the competencies of the students in demanding fields such as Electronics, Manufacturing and Teaching.

PO2: The program will develop student skills in analysis, interpretation of complex information of Physics and its applications in a technology-rich, interactive environment to meet the industrial needs.

Programme Specific Outcomes (PSOs):

On completion of program, the students will be able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems. The students will become professionally trained in the area of electronics, optical communication, nonlinear circuits, materials characterization and lasers. The students will get trained to apply their knowledge and skill in the design and development of Electronics circuits to cater to the needs of Electronic Industry They will excel in the research related to Physics and Materials characterization.

Course Outcomes (Cos):

Mathematical Physics I & II:

CO1: The objective of the course is to equip the M.Sc. students with the mathematical techniques that he/she needs for understanding theoretical treatment in different courses taught in this class and for developing a strong background if he/she chooses to pursue research in physics as a career.

CO2: The students will learn important mathematical functions such as Bessel function, Legender polynomial, Greens function etc. their basic properties and applications in physics so that he/she needs for understanding theoretical treatment in different courses

Classical Mechanics:

CO1: The course will train the students of in the Lagrangian and Hamiltonian formalisms to an extent that they can use these in the modern branches like Quantum Mechanics, quantum Field Theory, Condensed Matter Physics, Astrophysics etc.

Electrodynamics:

CO1: On completion the students will gain knowledge in Electrostatics and Magnetostatics fields including Boundary value problems, Maxwell equations in metals and plasma media, Poynting theorem for a complex vector field, Thomson and Compton scattering.

CO2: It also covers motions of relativistic and non- relativistic charged particles in electrostatic and magnetic fields.

Computational Physics:

CO1: The M.Sc. students will be familiarized with the numerical methods used in computation and programming using C language so that they can use these in solving simple problems pertaining to Physics.

Nuclear & Particle Physics:

CO1: The students will be taught the basic aspects of nuclear physics like static properties of nuclei, radioactive decays, nuclear forces and relatively advanced topics in nuclear models and nuclear reactions so that they understand the details of the underlying aspects so that they are equipped with the techniques used in studying these things.

Electronics-I & II :

CO1: This course covers semiconductor physics, physical principles of devices and their basic applications, Analysis of Passive and Active filters, OPAMP based analog circuits and introduction to various communication techniques.

CO2: The students will be introduced basics of integrated circuit technology, Microprocessor 8085 Architecture, instruction set, interfacing with memory and I/O devices.

Solid State Physics I & II:

CO1: This course will expose the students to the basic properties of solids, lattice vibrations, dielectric properties, energy band theory and transport theory so that they are equipped with the techniques used in investigating these aspects of the matter in condensed phase.

Quantum Mechanics I & II:

CO1: The aim of the course is to equip the students with the techniques of angular momentum, perturbation theory, scattering theory and techniques of quantum field theory so that they can use these in various branches of physics as per their requirement.

Statistical Mechanics:

CO1: This course will equip the students with the techniques of Ensemble theory so that he/she can use these to understand the macroscopic properties of the matter in bulk in terms of its microscopic constituents.

Optoelectronics:

CO1: This course will introduce the students to the basics of the challenging research field of optical fibers.

Material Science & Nanotechnology:

CO1: This course will familiarize the students. to the various aspects related to preparation, characterization and study of different properties of different kinds of materials so that they can pursue this emerging research field as career.

High Energy Physics:

CO1: This course will introduce the students to the various weak interactions, symmetries and conservation laws in high energy physics, unitary groups, Quark model and Quantum-chromodynamics so that they grasp the basics of high energy physics.

Astrophysics:

CO1: This course gives the basic understanding of the astronomical techniques, to understand the nature and structure of the universe from terrestrial planets to galaxies.

CO2: To understand the celestial phenomena related with the origin of the universe, galaxies, stars and planetary systems along with the synthesis of elements by stellar and primordial nucleosynthesis.

CO3: To explore the future evolution of the universe.

Experimental Techniques in Nuclear Physics:

CO1: The course will expose the students to theoretical aspects of different equipment and methods used in the fields of nuclear physics and particle physics.

Atomic and Molecular Spectroscopy:

CO1: This course will provide platform to the students to the various aspects of spectroscopy and their basic theory so that they can benefit this course in competitive examination and pursue this emerging research field as career.

Project Work

CO1: This course is in M.Sc. 4^{th} semester. This course will expose the students to preliminaries and methodology of research. It may consist of review of some research papers, development of a laboratory experiment, fabrication of a device, working out some problem, participation in some ongoing research activity, analysis of data, etc. Project work can be in Experimental Physics or Theoretical Physics in the thrust as well as non-thrust research areas of the department.

Chemistry (B.Sc.)

Programme Outcomes (Pos):

PO1: To demonstrate broad knowledge of descriptive Chemistry.

PO2: To impart the basic analytical and technical skills to work effectively in the various fields of chemistry.

PO3: To motivate critical thinking and analysis skills to solve complex chemical problems, e.g., analysis of data, synthetic logic, spectroscopy, structure and modeling, team-based problem solving, etc.

PO4: To demonstrate an ability to conduct experiments in the above sub-disciplines with mastery of appropriate techniques and proficiency using core chemical instrumentation and modeling methods.

PO5: To demonstrate the ability to perform accurate quantitative measurements with an understanding of the theory and use of contemporary chemical instrumentation, interpret experimental results, perform calculations on these results and draw reasonable, accurate conclusions.

PO6: To develop skills in quantitative modeling of static and dynamic chemical systems.

PO7: To develop laboratory competence in relating chemical structure to spectroscopic phenomena.

PO8: To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.

PO9: To provide knowledge and skill in Chemical Sciences.

PO10: To undertake research in emerging areas of Chemical Sciences and transform the findings for the benefit of the society.

PO11: To establish collaboration with industries and research Institutes to promote joint research projects.

PO12: To provide required knowledge in Chemical Sciences for all programs in science.

Programme Specific Outcomes (PSOs):

On successful completion of this Programme, students will have the ability to: • think critically and analyze chemical problems. • present scientific and technical information resulting from laboratory experimentation in both written and oral formats. • work effectively and safely in a laboratory environment use technologies/instrumentation to gather and analyze data. • work in

teams as well as independently. • apply modern methods of analysis to chemical systems in a laboratory setting**.** Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems. Students will be able to function as a member of an interdisciplinary problem solving team. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry.

Course Outcomes (Cos):

Inorganic Chemistry:

CO1: Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

CO2: Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

CO3: Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

CO4: Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

CO5: Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

CO6: Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

CO7: Students will be able to function as a member of an interdisciplinary problem solving team.

Organic Chemistry:

CO1: Know and recall the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.

CO2: Name the functional groups and different class of organic compounds.

CO3: Recognize the basic practical skills for the synthesis and analysis of organic compounds.

CO4: Synthesis, classification and isolation of different natural products

CO5: Design, synthesize and characterize drug molecules and polymers

CO6: Predict the reactivity of an organic compound from its structure.

CO7: Develop basic skills for the multi-step synthesis of organic compounds.

CO8: Justify a reasonable mechanism for a chemical reaction.

CO9: Write comprehensive reports on experiments such crystallization, distillation, synthesis, hydrogenation, isolation and filtration processes.

Physical Chemistry:

CO1: Chemical reactions and strategies to balance them.

CO2: The relative quantities of reactants and products.

CO3: The fundamental properties of atoms, molecules, and the various states of matter.

CO4: The electronic structure of atoms and its influence on chemical properties.

CO5: Molecular geometries of selected molecular species.

CO6: The fundamentals of acid/base chemistry, including pH calculations, buffer behavior, and acid/base titrations**.**

CO7: The energy and speed of chemical reactions.

CO8: Unit conversions and their importance in clinical medicine.

CO9: Molecular interactions and chemical reactions in the body.

CO10: The scientific method of collecting and analyzing information**.**

CO11: The basic (colligative) properties of solutions**.**

CO12: The fundamentals of acid/base equilibria, including pH calculations, buffer behavior, acid/base titrations, and their relationship to electrophiles and nucleophiles.

CO13: The thermodynamic and kinetic forces involved in chemical reactions which determine how much and how soon products are formed.

CO14: The basics of electrochemistry, and the relationship of electrical parameters to thermodynamic and stoichiometric parameters.

CO15: Current bonding models for simple inorganic and organic molecules in order to predict structures and important bonding parameters.

CO16: General periodicity patterns of (organic/inorganic) molecules, and the ability to design synthetic approaches to such species.

CO17: General chemical equilibria.

CO18: Solubility and complex ion equilibria.

CO19: Basic aspects of nuclear chemistry.

Chemistry (M.Sc.)

Programme Outcomes (Pos):

PO1: To demonstrate broad knowledge of descriptive Chemistry.

PO2: To impart the basic analytical and technical skills to work effectively in the various fields of chemistry.

PO3: To motivate critical thinking and analysis skills to solve complex chemical problems, e.g., analysis of data, synthetic logic, spectroscopy, structure and modeling, team-based problem solving, etc.

PO4: To demonstrate an ability to conduct experiments in the above sub-disciplines with mastery of appropriate techniques and proficiency using core chemical instrumentation and modeling methods.

PO5: To demonstrate the ability to perform accurate quantitative measurements with an understanding of the theory and use of contemporary chemical instrumentation, interpret experimental results, perform calculations on these results and draw reasonable, accurate conclusions.

PO6: To develop skills in quantitative modeling of static and dynamic chemical systems.

PO7: To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.

PO8: To provide knowledge and skill in Chemical Sciences.

PO9. To undertake research in emerging areas of Chemical Sciences and Transform the findings for the benefit of the society.

PO10. To establish collaboration with industries and research Institutes to promote joint research projects.

PO11. To provide required knowledge in Chemical Sciences for all programs in science.

PO12. To develop laboratory competence in relating chemical structure to spectroscopic phenomena.

Programme Specific Outcomes (PSOs):

On successful completion of this Programme, students will have the ability to: think critically and analyze chemical problems. present scientific and technical information resulting from laboratory experimentation in both written and oral formats. work effectively and safely in a laboratory environment use technologies/instrumentation to gather and analyze data. work in

teams as well as independently. apply modern methods of analysis to chemical systems in a laboratory setting**.** Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems. Students will be able to function as a member of an interdisciplinary problem solving team. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work.

Course Outcomes (Cos):

Inorganic Chemistry:

CO1: Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

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CO3: Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

CO4: Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

CO5: Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

CO6: Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

CO7: Students will be able to function as a member of an interdisciplinary problem solving team.

Organic Chemistry:

CO1: Know and recall the fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.

CO2: Name the functional groups and different class of organic compounds.

CO3: Recognize the basic practical skills for the synthesis and analysis of organic compounds.

CO4: Synthesis, classification and isolation of different natural products

CO5: Design, synthesize and characterize drug molecules and polymers

CO6: Predict the reactivity of an organic compound from its structure.

CO7: Develop basic skills for the multi-step synthesis of organic compounds.

CO8: Justify a reasonable mechanism for a chemical reaction.

CO9: Write comprehensive reports on experiments such crystallization, distillation, synthesis, hydrogenation, isolation and filtration processes.

Physical Chemistry:

CO1: The relationship between microscopic properties of molecules with macroscopic thermodynamic observables

CO2: The derivation of rate equations from mechanistic data

CO3: The use of simple models for predictive understanding of physical phenomena associated to chemical thermodynamics and kinetics

CO4: The limitations and uses of models for the solution of applied problems involving chemical thermodynamic and kinetics

CO5: Concepts in thermodynamics, different thermodynamic quantities such as heat and work and how they are measured, related or transformed from one to the other

CO6: States of matter and how they depend on temperature and pressure as well as how they co-exist in phase equilibria

CO7: Chemical equilibrium and its relationship with thermodynamic quantities.

CO8: The preparation for each experiment by studying lab handouts and links therein

CO9: Safety requirements and lab skills to perform physico-chemical experiments

CO10: How to keep records of instruments, parameters, and experimental observations

CO11: Reporting of experimental results (including error analysis) in a publication-style (journal paper)

CO12: An appreciation for modern problems and scientific controversies in physical chemistry

CO13: Key spectroscopic techniques including FTIR, UV-vis absorption, luminescence, laser methods**.**

CO14: The use of chemistry software programs to model energy potentials and vibrational levels of molecules**.**

CO15: The use of standard vacuum and cryogenic techniques used in physic-chemical experiments**.**

Analytical chemistry

CO1: The course gives an introduction to inorganic and organic analytical chemistry, including basic analytical methods. The laboratory course gives the students experience with quantitative methods of working.

CO2: Explain the theoretical principles and important applications of classical analytical methods within titration (acid/base titration, complexometric titration, redox titration), and various techniques within gravimetric and coulometric methods.

CO3: Explain the theoretical principles of selected instrumental methods within electroanalytical and spectrometric/spectrophotometric methods, and main components in such analytical instruments.

CO4: Explain the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques.

CO5: Assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.

CO6: Performing risk assessment of chemical experiments and chemical analytical activity

CO7: Performing classical analytical experiments, and make observations and assessments of important factors that could affect the analytical result.

CO8: Be familiar with calculations in analytical chemistry, be able to calculate titration errors for method evaluation, and perform statistical evaluation of results from classical and instrumental chemical experiments and analyses.

CO9: Make scientific reports from chemical experiments and present the results in a transparent manner.

CO10: Understand how different sampling techniques and instrumental methods can be used in speciation studies.

Chemistry of Life Science:

CO1: Recall the structure and properties of the major types of biological organic molecules, and be able to describe the relationships between structure, properties and functions;

CO2: Describe organic reaction mechanisms that impact on biochemical processes.

CO3: Discuss the fundamental chemistry of elements of biological importance, their significance to biological processes, and understand the biological transport and partitioning of solutes, hydrogen ions and water.

CO4: Describe the kinetics of reactions and diffusion processes;

CO5: Extend the appreciation of fundamental principles of chemistry into areas of major importance for the life sciences.

CO6: Safely and efficiently perform simple chemical laboratory processes;

CO7: Conduct, record, analyse and interpret chemical observations and measurements;

CO8: Effectively communicate the results, at a consolidating level;

CO9: Develop your scientific problem-solving skills.

Zoology (B.Sc.)

Programme Outcomes (Pos):

PO1: Technical Knowledge of Biological Science (core subjects) and Practice (applications of the subjects in profession).

PO2: Animal diversity and their conservation with sustainable development.

PO3: To impart knowledge about the Code of Conduct and Professional Integrity to practice the profession of Biology.

PO4: Providing floral and faunal importance to the society.

PO5: Development of environmental awareness and leadership qualities.

PO6: Brainstorming of the potential problems pertaining to technical, cognitive and communicative skills and their solutions by mentors.

PO8: Placement of Students/ Self-employment.

Programme Specific Outcomes (PSOs):

Bachelor of medical is a three year degree programme divided in six semesters. The students are introduced to the basics of zoology, botany, chemistry and english. Students are taught biodiversity, anatomy, physiology, evolutionary biology, development biology, comparative biology, ecology and biochemistry to understand the structure, functions and composition of the animal and plant body. The knowledge of biology is useful to identify the plants and animals taxonomically, along with the methods of conservation and utilization of flora and fauna.

The students after graduating have a wide array of options as below:

Trained youths will be beneficial to the society by rendering their services in Indian forest services/Provincial Forest Officers, Field Officer in banks, Biology laboratory technician.

Can grow as future microbiologist, biophysicist, zoologist, botanist and biochemist.

Higher Education:

Students after B. Sc., can pursue masters in Zoology, botany, microbiology, biophysics, biotechnology. Can find job opportunities in research, managerial and advisory options in wildlife & biodiversity boards or academic institutions.

Course Outcomes (Cos):

CO1: On successful completion of this subject the student will have knowledge about invertebrates, vertebrates and faunal diversity.

CO2: Can serve as IFS and PFS. As well as Lab assistants in laboratories, university and colleges.

Zoology (M.Sc.)

Programme Outcomes (PO):

PO1: Programme could provide well trained professionals of faunal diversity, Physiologist, Taxonomist, Herpetologist, Veterinary Technologists,

PO2: Development of educators at different levels of educational institutions (Teachers & Professors).

PO3: Development of research oriented minds and researchers, project Fellows and Scientists (ICR, CSIR, ICMR, DBT, CST, CBB, SBB). Wild life advisor and Conservationist in deferent organization (WWF, IUCN, Traffic India, BNHS) and Forest Department of deferent Stats, state Biodiversity Boards,

PO4: To impart knowledge about the animal handling and animal ethical issues.

PO5: Rendering services as Administrative officer (PFS & IFS), Wild life Conservators and Zoo-keepers.

PO6: Able to maintain aquarium, animal house, pisciculture, sericulture and lac culture.

PO7: Brainstorming of the potential problems pertaining to technical, cognitive and communicative skills and their solutions by mentors.

PO8: Placement of Students/ Self-Employment.

Programme Specific Outcomes (PSOs):

Masters in zoology is a Two-year programme divided in four semesters. The students are introduced to the basics of Animal diversity, Physiology, endocrinology, parasitology, embryology, ethology, immunology, ethiology, entomology, herpetology and biochemistry to understand the concepts and applications of these subjects in zoology and applied animal science. The students are taught with the basics of animal handling, molecular techniques, histo-pathological analysis and hematology. The knowledge of zoology is useful to gain understanding of animal health, culture, capture and economic importance with their ecological role in environment. The students after passing out M.Sc. programme, have the following placement options as below:

As Employee:

a) **Zoologist:** In NGO, private and Government institution.
b) **Technician:** In colleges, schools, university, institutional laboratory.

As Entrepreneur:

c) **As educators as awareness programme for the biodiversity and wildlife conservation.**

Course Outcomes (Cos):

Animal Physiology:

CO1: Knowledge will develop Animal physiologist, Zoologist and Toxicologist.

Animal Behavior:

CO1: Migration Investigator,

Fisheries:

CO1: Fisheries Inspector, ADF, Aqua-culturist, Pearl Fisheries, Chunk fisheries and Shell fisheries.

Entomology:

CO1: Apiculturist, Seri-culturist, Lac culture, Prawn fisheries, Shrimp culture,

Toxicology:

CO1: Toxicologist, Environmentalist, Scientist in CPCB, SPCB,

Wildlife Conservation :

CO1: Wild life advisor and Conservationist in deferent organization (WWF, IUCN, Traffic India, BNHS) and Forest Department of deferent Stats, state Biodiversity Boards,

M.Sc. (Biotechnology)

Programme Outcomes (Pos):

PO1: Biotechnology as a subject has grown rapidly and as far as employment is concerned, it has become one of the fast growing sectors. Employment record shows that biotechnology has a great scope in future. Biotechnologists can find careers with pharmaceutical companies, chemical, agricultural and allied companies.

PO2: They can be employed in the areas of planning, production and management of bioprocessing industries. There is a large scale employment in research laboratories run by the government as well as the corporate sectors.

Programme Specific Outcomes (PSOs):

Biotechnology post-graduate students may find work in government based entity such as universities, research institutes or at private centres as research scientists/assistants. Alternatively, they may find employment in specialized biotechnology companies or biotech-related companies such as pharmaceutical firms, food manufacturers, aquaculture and agricultural companies that are engaged in business related to life sciences ranging from equipment to chemicals to pharmaceuticals and diagnostics. Different job profiles for biotechnologists include research scientists, academicians, lab technicians, research associates, engineers, sales representatives, marketing executives and business development managers. The scope of work can range from research, sales, marketing, administration, quality control, breeding, technical support etc

Course Outcomes (Cos):

Biomolecules:

CO1: The course explores the chemistry of living organisms and that of their biological processes.

CO2: It deals with the chemical combinations and reactions that takes place because of the biological processes such as growth, reproduction, metabolism, heredity

Microbiology:

CO1: This course enables students with detailed understanding of micro-organisms, their role in biotechnology and other relevant industries.

Molecular Cell Biology

CO1: It deals with the study of the structure and function of living systems at the molecular level. It focuses mainly on DNA, RNA, Protein Synthesis and their regulatory

mechanism. A molecular biologist aims to understand the functions of cells at molecular level.

Biotechniques:

CO1: The M.Sc. students will be familiarized with original laboratory methods, related technical tools, and methods-oriented review articles that are of broad interest to professional life scientists, as well as to scientists from other disciplines (e.g., chemistry, physics, computer science, plant and agricultural science and climate science) interested in life science applications for their technologies.

Principles of Genetic Engineering:

CO1: To understand the general principles of gene organization and expression in prokaryotic and eukaryotic organisms, basic pathways and mechanisms in biological energy transduction and cell cycle control and relate properties of cancerous cells to mutational changes in gene function.

Biosafety, Computer Application & Biostatistics:

CO1: On completion of this course the students will be acquainted with basics of computer applications, biosafety guidelines and measures to be followed and basics of biostatistics and statistical analysis of research data

Immunology & Immunotechnology:

CO1: It deals with the study of the tissues, cells and molecules involved in host defence mechanisms. Immunologists attempt to understand how the immune system develops, how the body defends itself against disease, and what happens when it all goes wrong.

Enzyme Technology:

CO1: To enable the students to understand advanced concepts related to working of enzymes, their properties and application in various industries and research.

Animal Biotechnology:

CO1: To enable the students to understand the molecular biology techniques which were used to genetically engineer (i.e. modify the genome of) animals in order to improve their suitability for pharmaceutical, agricultural or industrial applications.

CO2: Animal biotechnology has been used to produce genetically modified animals that synthesize therapeutic proteins, have improved growth rates or are resistant to disease

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Molecular Genetics:

CO1: To understand the general principles of gene organization and expression in prokaryotic and eukaryotic organisms, basic pathways and mechanisms in biological energy transduction and cell cycle control and relate properties of cancerous cells to mutational changes in gene function.

Environmental Biotechnology:

CO1: Environmental biotechnology is biotechnology that is applied to and used to study the natural environment. In nutshell, environmental biotechnology is the integration of natural and engineering sciences to achieve the application of organisms, cells, parts thereof and molecular analogues for products and services.

Industrial Biotechnology:

CO1: This course aims to introduce various industries where biotechnology is used. It enables students to understand the concept of application of biotechnology in different industries, fermentation and scale-up.

Food Biotechnology:

CO1: To enable the students to learn application of biotechnology in food industry.

Plant Biotechnology:

CO1: The course will enable the students to acquire knowledge about various techniques like micropropagation, single cell culture, suspension culture, protoplast culture, hairy root culture and various techniques of recombinant DNA technology to produce genetically modified organisms with novel characters.

Bioinformatics, Bioethics and IPR:

CO1: This course provides knowledge about basics of bioinformatics and its applications, bioethics and different bioethics regulatory agencies. The students will also learn about IPR, its types and differences, and applications.

Genomics and Proteomics:

CO1: Genomics is the new science that deals with the discovery and noting of all the sequences in the entire genome of a particular organism. Likewise, Proteomics helps in understanding the structure and function of different proteins as well as protein-protein interactions

English (Ph.D.)

Programme Outcomes (Pos):

PO1: Doctoral degree in English is meant for the students who have a profound affection for Language and Literature.

PO2: This programme enables the scholars with the vast and deep knowledge of the Englis Language and Literature.

PO3: This specific course update and aware the students with new perspectives and approaches of Literature.

PO4: The course further motivates the students towards the different areas of research in English Literature.

Communication Skills and Personality Development Classes in UG and PG:

PO1: This Programme enables the students with the ability of Soft Skills and Communication Skills by grooming their personality.

PO2: Students, equipped with these skills enhance their professional ability to enlighten their career path.

PO3: This program prepares the students as professions with the help of Personality development.

Programme Specific Outcomes (PSOs):

It is a **3-years** doctorate degree in English, essentially consisting of research work. After completion of the course, for procurement of the degree, scholars are needed to submit a detailed thesis. The advanced course in English literature comprises literature not only by authors from one country, but from across the globe.

The Scholars after Doctoral Degree have a wide array of options as below:

As Employee:

a) **As scholars or educators:** After completion of this Programme, The students acquire the knowledge about the various types of Research Domain and they represent themselves as Scholars and as Educators in the various Institutions and in Universities.
b) **Post-Doctoral Research**:This Programme also enables the students for the Post-Doctoral Research in different areas of English Literature.
c) **Research Guide**:Those who have acquired expertise in the English Literature can further supervise upcoming Scholars.

As Entrepreneur:

a) Professional Skill Trainer-With the Knowledge of English a scholar canguide the Students and enhance their professional skills in his private institute.
b) Editor of Journals- A Scholar may also start his journal of his own and can work as an editor.

Higher Education:

Students after Doctorate can pursue Post Doctorate in literature, to find job opportunities in research and in the field of Literature.

Communication Skills and Personality Development Classes in UG and PG:

This program provides well trained professionals for every job sector. It is beneficial in social interaction, developing a healthy mind, body and life style, enable the students to identify one's own strengths and weaknesses and learning how to develop skills. Purpose of this course is to equip learners with tools for formal communication which includes group discussion, debate, JAM Sessions, report writing, formal letters.

The students after passing out UG and PG programmes, havethe following placement options as below:

As Employee:

d) Professionals: After completion of their UG and PG, The students acquire the knowledge about personality traits, soft skills and communication skills and they represent themselves as professionals in industry and organizations.
e) Skills Trainer: This Programme also enables the students as the Skills trainers in different organizations.
f) Trained Graduates and Post Graduates: This Programme also preparer Trained Graduates and Post Graduates as per the industry and organizational needs.

As Entrepreneur:

g) Soft skills trainer- They may start their self-Soft Skills Training institute**.**
h) IELTS trainers- They may Work as IELTS trainers

Higher Education:

Students after passing UG and PG Course can pursue his/ her Higher Education in their respective fields.

Course Outcomes (Cos):

English Literature:

CO1: To understand the basics of different Literary terms and theories.

CO2: To understand various research in the English Literature.

CO3: To develop the new perspective towards literature.

Writing in different field as expatriate literature/Indian English Writing:

CO1: To understand the Writing in Literature.

CO2: To understand Indian writers in the field of English Literature.

CO3: To understand current Indian Issues to discuss.

Course Outcomes (Cos):

Communication Skills and Personality Development Classes in UG and PG:

CO1: To understand the basics of different Soft Skills.

CO2: To know various stages of Personality developments

CO3: To Develop Communication Skills.

CO4: To learn and practice verbal and non-verbal communication along with managerial skills.

Mathematics (BCA):

Programme Outcomes (Pos):

PO1: This programme provide a training to students for jobs in different sectors like Banking sectors, Computer industry, biotech industries, pharmaceutical industries etc .

PO2: Hands-on practical training on sophisticated analytical instruments, biomedical devices, simulated software for animal studies, drug designing through CADD.

PO3: To impart knowledge about the Code of Conduct and Professional Integrity

PO4: Development of Team spirit and leadership qualities.

PO5: Effective verbal and non-verbal communication while dealing with professional clients and peers.

PO6: Brainstorming of the potential problems pertaining to technical, cognitive and communicative skills and their solutions by mentors.

PO7: Placement of Students/ Self-employment.

Programme Specific Outcomes (PSOs):

Bachelor of Computer Application is a three year degree programme divided in six semesters. The students are introduced to the basics of Computer, Accounts, Modulation, Programming and Mathematics for the synthesis, analysis and instrumentation. Students are taught basics of Computer, Accounts, Modulation, Programming and Mathematics of the pure and applied Computer Sciences. Knowledge of these basic subjects is essential for thorough understanding of the concepts and applications of basics of Computer, Accounts, Modulation, Programming and Mathematics which will help students to understand the fundamentals laws of nature which are essential in understanding the principles of the technology. After completing the course the students are well trained in basics of Computer, Accounts, Modulation, Programming and Mathematics. Students will be able to analyze real world problems, in fruitful decision making and will have knowledge of basics of Computer, Accounts, Modulation, Programming and Mathematics laws.

As Entrepreneur:

c) **Own Wholesale shop:** Students after graduating have enough knowledge of hardware and software to start wholesale shop.
d) **Set up a Computer Manufacturing Unit:** After passing out BCA, the students can apply to the license to set up a Computer manufacturing unit.

Higher Education:

Students after BCA can pursue for MCA and Law (LLB) and (MBA) to find job opportunities in research, managerial and advisory options in Pharmaceutical industry or academic institutions.

Course Outcomes (Cos):

Real Analysis:

CO1: This provides the knowledge of different kind of properties of functions defined on different sets.

CO2: This also provides the knowledge of how to use these properties to solve real world problems.

Algebra:

CO1: Enables to students to understand different properties of a set and different kind of relationships between different kinds of sets.

CO2: It improves the analytic approach and develops reasoning power of students.

Discrete Mathematics:

CO1: This provides a study of mathematics used in computer and machines

CO2: It enables student to understand the language of machines.

Differential Equations:

CO1: It enables students of solve different kind of differential equations which appears in different branches of science and engineering.

CO2: It enables students to formulate differential equations of real world problems.

Numerical Methods:

CO1: It enables students to learn tools to solve different kind of numerical problems arriving in science and engineering.

CO2: It improves numerical problem solving ability of students.

Mathematics (B.Sc. non-medical):

Programme Outcomes (Pos):

PO1: This programme provide a training to students for jobs in different sectors like Banking sectors, Computer industry, biotech industries, pharmaceutical industries etc .

PO2: Hands-on practical training on sophisticated analytical instruments, biomedical devices, simulated software for animal studies, drug designing through CADD.

PO3: To impart knowledge about the Code of Conduct and Professional Integrity

PO4: Development of Team spirit and leadership qualities.

PO5: Effective verbal and non-verbal communication while dealing with professional clients and peers.

PO6: Brainstorming of the potential problems pertaining to technical, cognitive and communicative skills and their solutions by mentors.

PO7: Placement of Students/ Self-employment.

Programme Specific Outcomes (PSOs):

Bachelor of Science is a three year degree programme divided in six semesters. The students are introduced to the basics of Physics, Chemistry and Mathematics for the synthesis, analysis and instrumentation. Students are taught Physics, Chemistry and Mathematics to understand the structure, functions and composition of the pure and applied Sciences. Knowledge of these basic subjects is essential for thorough understanding of the concepts and applications of Physics, Chemistry and Mathematics which will help students to understand the fundamentals laws of nature which are essential in understanding the principles of the technology. After completing the course the students are well trained in Mathematics, Physics and Chemistry. Students will be able to analyze real world problems, in fruitful decision making and will have knowledge of physical, chemical and Mathematical laws.

Course Outcomes (Cos):

Real Analysis:

CO1: This provides the knowledge of different kind of properties of functions defined on different sets.

CO2: This also provides the knowledge of how to use these properties to solve real world problems.

Algebra:

CO1: Enables to students to understand different properties of a set and different kind of relationships between different kinds of sets.

CO2: It improves the analytic approach and develops reasoning power of students.

Differential Equations:

CO1: It enables students of solve different kind of differential equations which appears in different branches of science and engineering.

CO2: It enables students to formulate differential equations of real world problems.

Discrete Mathematics:

CO1: This provides a study of mathematics used in computer and machines

CO2: It enables student to understand the language of machines.

Complex Analysis:

CO1: This provides the knowledge of different kind of properties of complex functions defined on different sets.

CO2: This also provides the knowledge of how to use these properties to solve real world problems.

Mathematics (M. Sc):

Programme Outcomes (POs)

PO1: Technical Knowledge of Mathematical Science (core subjects) and Practice (applications of the subjects in real world).

PO2: To impart knowledge about the Code of Conduct and Professional Integrity to practice the profession of Mathematics.

PO3: Effective verbal and non-verbal communication while dealing with professional.

PO4: To impart knowledge about the interest of Mathematics and handling the requirements of real world.

PO5: Brainstorming of the potential problems pertaining to technical, cognitive and communicative skills and their solutions by mentors.

PO6: Placement of Students/ Self-Employment.

Programme Specific Outcomes (PSOs):

Master of Science in Mathematics is a two years degree programme divided in four semesters. The students are introduced to the Pure and Applied Mathematics to develop analytical and numerical ability. Students are taught Pure and Applied Mathematics to understand the structure, functions and composition of the pure and applied Sciences. Knowledge of these basic subjects is essential for thorough understanding of the concepts and applications of Pure and Applied Mathematics which will help students to understand the fundamentals laws of nature which are essential in understanding the principles of the technology. After completing the course the students are well trained in Pure and Applied Mathematics. Students will be able to analyze real world problems, in fruitful decision making and will have knowledge of Pure and Applied Mathematics laws.

The students after graduating have a wide array of options as below:

As Employee:

a) **Teaching Industry:** Students keen to make their career in a teaching have the following job profiles:
   - **i) School Teacher** etc.
   - **ii) College Teacher.**
   - **iii) University Professor.**

b) **Research Industry**: Students keen to make their career in as a research in all departments as Mathematics is fundamental requirement research topics.

c) **Banking Sector:** To fulfill the requirement of banking sector, M.Sc students have required potentials.
d) **Marketing:** As sales representatives. Freshers are inducted as trainee in the Business Development Team or Marketing and Sales Representatives. They are generally promoted as Area Sales Manager, Regional Sales Manager and Vice President
e) **Analyst / Statistician:** As Government certified Analysts in Government Drug Testing Laboratories and Pharmaceutical industries.

As Entrepreneur:

e) **Own School set up:** Students after M.Sc, they can set up their own School.
f) **Set up a Coaching Academy:** Students after M. Sc, they can set up their own coaching academy.
g) **Set up a Contract Research Organization (CRO):** Students can set up their own CRO and get necessary approvals and certifications from the Government Accreditation/ Licensing Authorities to take up contract research projects.

Higher Education:

Students after M.Sc. can pursue Ph.D, M.tech in Computer Science to find job opportunities in research, managerial and advisory options in academic institutions.

Course Outcomes (Cos):

Real Analysis:

CO1: This provides the knowledge of different kind of properties of functions defined on different sets.

CO2: This also provides the knowledge of how to use these properties to solve real world problems.

Algebra:

CO1: Enables to students to understand different properties of a set and different kind of relationships between different kinds of sets.

CO2: It improves the analytic approach and develops reasoning power of students.

Differential Equations:

CO1: It enables students of solve different kind of differential equations which appears in different branches of science and engineering.

CO2: It enables students to formulate differential equations of real world problems.

Discrete Mathematics:

CO1: This provides a study of mathematics used in computer and machines

CO2: It enables student to understand the language of machines.

Complex Analysis:

CO1: This provides the knowledge of different kind of properties of complex functions defined on different sets.

CO2: This also provides the knowledge of how to use these properties to solve real world problems.

Differential Geometry:

CO1: It provides the knowledge of geometric properties of higher dimensional mathematical objects.

CO2: This also provides opportunity to visualize and understand the properties of higher dimensional mathematical objects.

Topology:

CO1: Enables to students to understand the properties of higher dimensional mathematical objects.

CO2: This also provides opportunity to visualize higher dimensional mathematical objects.

Functional Analysis:

CO1: This provides the knowledge of function defined on more complicated sets and defined on higher dimensional objects

CO2: It also provides different kind of properties of these functions.

Integral Transforms:

CO1: It enables students to learn tools to solve different kind of numerical problems arriving in science and engineering.

CO2: It also improve numerical problem solving capacity of students.

Discrete Mathematics:

CO1: This provides a study of mathematics used in computer and machines

CO2: It enables student to understand the language of machines.