



2.6

Student Performance and Learning Outcomes

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Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website

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POs and COs B.Sc. and M.Sc.

I. Program Outcomes for M.Sc.:

Introduction:


The Bachelor of Science (B.Sc.) is an undergraduate degree program that is designed to provide students with a broad understanding of the science. The program under the Pandit Deendayal Upadhyaya Shekhawati University, Sikar, Rajasthan, offers two groups of option Physics, Chemistry and Maths, And Chemistry, Botany and Zoology. **The compulsory subjects** for B.Sc. are English, Hindi, Elementary Computers, and Environmental Studies. The B.Sc. program is designed to prepare students for a variety of career paths, including further academic study, government service, non-profit organizations, and the private sector.

Program Outcomes for B.Sc. Program:

1. **Knowledge of core scientific principles:** Students will develop a strong foundation in core scientific principles, theories, and concepts related to their chosen field of study. They will acquire a broad understanding of scientific disciplines such as physics, chemistry, biology, mathematics, computer science, or other specialized areas within the sciences.
2. **Practical laboratory skills:** Students will gain hands-on experience in laboratory settings, developing practical skills in conducting scientific experiments, data collection, analysis, and interpretation. They will learn to use laboratory equipment and techniques relevant to their field of study.
3. **Critical thinking and problem-solving skills:** Students will develop critical thinking and problem-solving skills necessary for scientific inquiry. They will learn to analyze complex scientific problems, apply logical reasoning, and propose effective solutions based on evidence and scientific principles.
4. **Research and inquiry skills:** Students will acquire research and inquiry skills specific to their field of study. They will learn to gather and evaluate scientific information, critically analyze research papers, and conduct independent research


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projects. They will develop skills in experimental design, data analysis, and scientific writing.

- 5. Effective communication of scientific information:** Students will enhance their oral and written communication skills to effectively convey scientific information. They will learn to present scientific concepts, research findings, and experimental results in a clear, concise, and organized manner. They will also develop skills in scientific writing, report preparation, and presentation techniques.
- 6. Collaboration and teamwork:** Students will develop skills in collaboration and teamwork, as they engage in group projects, laboratory experiments, and scientific discussions. They will learn to work effectively in diverse teams, contribute their expertise, and respect different perspectives in scientific endeavors.
- 7. Ethical and responsible scientific practices:** Students will understand the ethical considerations and responsible practices in scientific research and applications. They will be aware of scientific integrity, research ethics, and the responsible use of scientific knowledge for the benefit of society and the environment.
- 8. Application of scientific knowledge:** Students will be able to apply their scientific knowledge and skills to solve real-world problems. They will understand the practical applications of science in various fields such as healthcare, technology, environmental sustainability, agriculture, or industry. They will contribute to innovation and advancements in their respective fields.
- 9. Lifelong learning and professional development:** Students will develop a commitment to lifelong learning and professional development in the sciences. They will recognize the importance of staying updated with advancements in their field, engaging in continuous learning, and pursuing further education or professional opportunities in academia, research, industry, or other scientific careers.
- 10. Interdisciplinary perspective:** Students will develop an interdisciplinary perspective by exploring the connections between different scientific disciplines and understanding how scientific knowledge integrates with other fields of study. They

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will recognize the interdependence of scientific disciplines and their role in addressing complex societal challenges.

The B.Sc. program under the directions of the Pandit Deendayal Upadhyaya Shekhawati University, Sikar, Rajasthan, is designed to provide students with a broad understanding of the Sciences. The B.Sc. program aims to provide students with a comprehensive scientific education and equip them with the knowledge, skills, and attitudes necessary for success in their chosen scientific fields. By achieving the program outcomes outlined above, students will develop a strong foundation in scientific principles, critical thinking abilities, research skills, and effective communication. They will be prepared for further education, scientific careers, and contribute to scientific advancements and the betterment of society.

II. Course Outcomes of B.Sc.

List of Courses:

Optional subjects:

1. Physics
2. Mathematics
3. Chemistry
4. Botany
5. Zoology


Compulsory Subjects:

1. English
2. Hindi
3. Elementary Computers
4. Environmental Studies

Course Outcomes for B.Sc. Compulsory Subjects:


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1. English:

a. Language Proficiency: Students will be able to communicate effectively in English, both verbally and in writing, with a strong focus on grammar, vocabulary, and pronunciation.

b. Literary Appreciation: Students will be able to understand, analyze, and appreciate literary texts from a variety of genres and periods.

c. Critical Thinking: Students will be able to think critically and analyze complex ideas and arguments presented in English texts.

2. Hindi:

a. Language Proficiency: Students will be able to communicate effectively in Hindi, both verbally and in writing, with a strong focus on grammar, vocabulary, and pronunciation.

b. Literary Appreciation: Students will be able to understand, analyze, and appreciate literary texts from a variety of genres and periods written in Hindi.

c. Cultural Understanding: Students will be able to understand the cultural context of Hindi literature and its contribution to Indian culture.

3. Computer Education:

a. Computer Literacy: Students will be able to use computers and related technologies effectively and efficiently for a variety of purposes, including data management, communication, and creative expression.

b. Digital Citizenship: Students will be able to understand the ethical and legal issues related to the use of technology, including online safety, privacy, and security.

c. Problem Solving: Students will be able to use computer technology to solve real-world problems and make informed decisions based on data and information.


4. Environmental Studies:

a. Environmental Awareness: Students will be able to understand the impact of human activity on the environment and develop an appreciation for the importance of sustainability and conservation.

b. Scientific Literacy: Students will be able to understand basic scientific concepts related to the environment and use scientific methods to analyze and evaluate environmental issues.


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c. **Responsible Citizenship:** Students will be able to take responsibility for their individual impact on the environment and develop strategies to minimize their ecological footprint.

Course Outcomes for B.Sc. Optional Subjects for 1st, 2nd and 3rd years:

Course Outcomes for B.Sc. Physics:

- Understanding of fundamental physics concepts: Students will develop a deep understanding of fundamental concepts in physics, including classical mechanics, electromagnetism, thermodynamics, quantum mechanics, and relativity. They will grasp the foundational principles that govern the behavior of matter and energy.
- Proficiency in mathematical and computational skills: Students will acquire proficiency in mathematical and computational techniques essential for solving physics problems. They will be able to apply mathematical concepts, such as calculus, differential equations, linear algebra, and numerical methods, to analyze physical phenomena and perform calculations.
- Laboratory skills and experimental techniques: Students will gain hands-on experience in laboratory settings, learning experimental techniques, data acquisition, and analysis. They will develop skills in using laboratory equipment, conducting experiments, and interpreting experimental results. They will also understand the importance of safety protocols in laboratory environments.
- Problem-solving and critical thinking abilities: Students will develop problem-solving and critical thinking abilities specific to physics. They will learn to analyze complex problems, break them down into manageable components, apply appropriate mathematical and theoretical models, and arrive at logical solutions. They will also develop skills in reasoning and evaluating scientific arguments.
- Application of physics principles: Students will be able to apply physics principles and concepts to real-world situations. They will understand the practical applications

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of physics in areas such as engineering, technology, medicine, energy, and environmental sciences. They will be able to analyze and solve problems related to these applications.

- **Computational modeling and simulation:** Students will gain proficiency in using computational tools and software for modeling and simulating physical systems. They will learn to construct computational models, simulate physical phenomena, and analyze the results. They will also develop skills in visualizing and interpreting simulation data.
- **Effective communication of physics concepts:** Students will enhance their oral and written communication skills to effectively communicate physics concepts and findings. They will learn to present scientific information, experimental results, and theoretical explanations in a clear and concise manner. They will also develop skills in scientific writing, report preparation, and presentation techniques.
- **Integration of interdisciplinary knowledge:** Students will develop an understanding of the interdisciplinary nature of physics and its connections with other scientific disciplines, such as mathematics, chemistry, biology, and engineering. They will recognize how physics interacts with these fields to address complex scientific problems and contribute to technological advancements.
- **Ethical and responsible scientific practices:** Students will understand the ethical considerations and responsible practices in scientific research and applications. They will adhere to professional ethics, scientific integrity, and safety protocols while conducting experiments and working with scientific data. They will also be aware of the societal implications of physics and consider ethical aspects in their work.
- **Continuous learning and professional development:** Students will develop a commitment to continuous learning and professional development in the field of physics. They will recognize the importance of staying updated with advancements in physics, engaging in lifelong learning, and pursuing further education or professional opportunities in academia, research, industry, or other physics-related careers.

Conclusion: The B.Sc. Physics program aims to provide students with a solid foundation in physics and equip them with the knowledge, skills, and attitudes necessary for a successful


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career in the field. By achieving the course outcomes outlined above, students will develop a strong understanding of fundamental physics concepts, mathematical and computational skills, laboratory techniques, problem-solving abilities, and effective communication skills. They will be prepared for further studies in physics or related fields, research positions, or careers in industries that require expertise in physics. They will contribute to scientific advancements, technological innovations, and the understanding of the physical world.

Course Outcomes for B.Sc. Mathematics:

- Proficiency in mathematical fundamentals: Students will develop a solid foundation in mathematical fundamentals, including algebra, calculus, geometry, number theory, and discrete mathematics. They will have a deep understanding of mathematical concepts, definitions, and theorems.
- Problem-solving and logical reasoning skills: Students will enhance their problem-solving and logical reasoning skills through the study of mathematics. They will learn to analyze complex problems, apply appropriate mathematical techniques, and arrive at logical solutions. They will develop the ability to think critically and abstractly.
- Advanced mathematical techniques: Students will acquire knowledge and skills in advanced mathematical techniques such as differential equations, linear algebra, complex analysis, probability theory, and mathematical modeling. They will be able to apply these techniques to solve complex mathematical problems.
- Mathematical proof and rigorous reasoning: Students will develop the ability to construct mathematical proofs and engage in rigorous reasoning. They will learn different proof techniques, logical deductions, and methods of mathematical argumentation. They will understand the importance of mathematical rigor and precision.
- Computational and technological skills: Students will gain proficiency in using mathematical software, programming languages, and computational tools for mathematical analysis and simulations. They will be able to use technology effectively to solve mathematical problems, visualize mathematical concepts, and analyze data.

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- **Mathematical modeling and applications:** Students will learn to apply mathematical concepts and techniques to real-world problems. They will understand the process of mathematical modeling, formulate mathematical models, and analyze them to draw meaningful conclusions. They will be able to apply mathematics to various fields, such as physics, economics, engineering, and computer science.
- **Mathematical communication:** Students will enhance their communication skills specific to mathematics. They will be able to communicate mathematical ideas, proofs, and solutions effectively in oral and written forms. They will develop skills in mathematical writing, presenting mathematical arguments, and explaining complex concepts to others.
- **Collaborative and interdisciplinary work:** Students will develop skills in collaborative work and interdisciplinary thinking. They will engage in group projects, problem-solving exercises, and mathematical discussions. They will learn to work effectively in teams, respect different perspectives, and contribute their mathematical expertise to interdisciplinary contexts.
- **Appreciation of mathematical beauty and creativity:** Students will develop an appreciation for the beauty, elegance, and creativity of mathematics. They will recognize the aesthetic aspects of mathematical concepts, patterns, and structures. They will develop a curiosity for exploring new mathematical ideas and discoveries.
- **Lifelong learning and professional development:** Students will develop a commitment to lifelong learning and professional development in the field of mathematics. They will recognize the importance of staying updated with advancements in mathematics, engaging in continuous learning, and pursuing further education or career opportunities in academia, research, industry, or other mathematics-related fields.

Conclusion: The B.Sc. Mathematics program aims to provide students with a strong foundation in mathematics and equip them with the knowledge, skills, and attitudes necessary for success in the field. By achieving the course outcomes outlined above, students will develop proficiency in mathematical fundamentals, problem-solving abilities, logical reasoning skills, and advanced mathematical techniques. They will be prepared for further studies in mathematics or related fields, research positions, or careers in industries that


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require mathematical expertise. They will contribute to mathematical advancements, scientific research, technological innovations, and the development of quantitative methods.

Course Outcomes for B.Sc. Chemistry:

- Understanding of fundamental concepts: Students will develop a thorough understanding of fundamental concepts in chemistry, including atomic structure, chemical bonding, thermodynamics, kinetics, equilibrium, and organic chemistry. They will grasp the foundational principles that govern the behavior of matter and chemical reactions.
- Laboratory skills and techniques: Students will gain hands-on experience in laboratory settings, learning essential laboratory techniques, safety protocols, and equipment handling. They will develop skills in conducting experiments, analyzing data, and interpreting experimental results. They will also learn to maintain accurate laboratory records.
- Knowledge of chemical reactions and mechanisms: Students will acquire knowledge of various chemical reactions, their mechanisms, and the factors that influence them. They will understand the principles of chemical kinetics, thermodynamics, and equilibrium, and apply them to analyze and predict the outcomes of chemical reactions.
- Proficiency in analytical methods: Students will develop proficiency in using analytical methods and instruments to analyze and characterize chemical substances. They will learn techniques such as spectroscopy, chromatography, and electrochemical methods for qualitative and quantitative analysis.
- Problem-solving and critical thinking abilities: Students will develop problem-solving and critical thinking abilities specific to chemistry. They will learn to analyze complex chemical problems, propose hypotheses, design experiments, and interpret data to arrive at logical conclusions. They will also develop skills in evaluating scientific arguments and applying critical thinking in chemical research.

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- Organic and inorganic synthesis: Students will gain knowledge and practical skills in organic and inorganic synthesis. They will learn to design and carry out organic and inorganic reactions, understand reaction mechanisms, and synthesize target compounds. They will also develop skills in purification and characterization of synthesized compounds.
- Application of chemistry in real-world contexts: Students will be able to apply chemical principles and concepts to real-world contexts. They will understand the practical applications of chemistry in areas such as pharmaceuticals, materials science, environmental science, energy production, and chemical industries. They will be able to analyze and solve problems related to these applications.
- Effective communication of chemical information: Students will enhance their oral and written communication skills to effectively communicate chemical concepts and findings. They will learn to present scientific information, experimental results, and theoretical explanations in a clear and concise manner. They will also develop skills in scientific writing, report preparation, and presentation techniques.
- Ethical and responsible scientific practices: Students will understand the ethical considerations and responsible practices in chemical research and applications. They will adhere to professional ethics, safety protocols, and environmental regulations while conducting experiments and working with hazardous chemicals. They will also be aware of the societal impact of chemical research and consider ethical aspects in their work.
- Continuous learning and professional development: Students will develop a commitment to continuous learning and professional development in the field of chemistry. They will recognize the importance of staying updated with advancements in chemistry, engaging in lifelong learning, and pursuing further education or professional opportunities in academia, research, industry, or other chemistry-related careers.

Conclusion: The B.Sc. Chemistry program aims to provide students with a comprehensive understanding of chemistry and equip them with the knowledge, skills, and attitudes necessary for success in the field. By achieving the course outcomes outlined above, students will develop a strong foundation in chemistry concepts, laboratory skills, analytical


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techniques, problem-solving abilities, and effective communication skills. They will be prepared for further studies in chemistry or related fields, research positions, or careers in industries that require chemical expertise. They will contribute to scientific advancements, technological innovations, environmental sustainability, and the understanding of chemical processes.

Course Outcomes for B.Sc. Botany:

- Understanding of plant structure and function: Students will develop a comprehensive understanding of plant structure, including cells, tissues, organs, and their functions. They will learn about the morphology, anatomy, and physiology of plants, including their growth, development, and reproductive processes.
- Knowledge of plant diversity: Students will acquire knowledge of plant diversity, including the classification, identification, and nomenclature of different plant groups. They will study the major plant taxa, including algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms, and understand their evolutionary relationships.
- Understanding of plant ecology: Students will gain an understanding of plant ecology and their interactions with the environment. They will learn about ecological concepts, such as population dynamics, community interactions, ecosystem structure, and nutrient cycling. They will explore the impact of environmental factors on plant distribution, adaptation, and responses.
- Proficiency in laboratory techniques: Students will develop practical skills in laboratory techniques relevant to botany. They will learn plant collection, preservation, and identification methods. They will gain proficiency in microscopy, staining techniques, tissue culture, and molecular biology techniques used in botany research.
- Knowledge of plant biotechnology: Students will be introduced to the principles and applications of plant biotechnology. They will learn about genetic engineering, plant tissue culture, plant breeding, and genetic modification of plants. They will understand the ethical considerations and potential benefits of plant biotechnology.


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- Awareness of plant interactions with humans: Students will explore the various ways in which plants interact with humans. They will study the economic importance of plants, including their role in agriculture, forestry, horticulture, and medicinal applications. They will understand the conservation and sustainable use of plant resources.
- Research and data analysis skills: Students will develop skills in conducting botanical research, including experimental design, data collection, and statistical analysis. They will learn to analyze and interpret scientific data, critically evaluate research findings, and communicate their results effectively.
- Effective communication of botanical knowledge: Students will enhance their communication skills to effectively convey botanical knowledge. They will learn to present scientific information, research findings, and botanical concepts in oral and written forms. They will develop skills in scientific writing, report preparation, and presentation techniques specific to botany.
- Ethical and responsible practices: Students will understand the ethical considerations and responsible practices in botanical research and applications. They will adhere to professional ethics, safety protocols, and conservation principles while studying and working with plants. They will be aware of the importance of biodiversity conservation and sustainable practices in botanical sciences.
- Lifelong learning and professional development: Students will develop a commitment to lifelong learning and professional development in the field of botany. They will recognize the importance of staying updated with advancements in botanical research, engaging in continuous learning, and pursuing further education or career opportunities in academia, research, industry, or other botany-related fields.

Conclusion: The B.Sc. Botany program aims to provide students with a comprehensive understanding of plant biology and equip them with the knowledge, skills, and attitudes necessary for success in the field. By achieving the course outcomes outlined above, students will develop a strong foundation in plant structure, function, diversity, ecology, and biotechnology. They will gain proficiency in laboratory techniques, research skills, and effective communication of botanical knowledge. They will be prepared for further studies in botany or related fields, research positions, or careers in industries that require botanical


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expertise. They will contribute to scientific advancements, environmental conservation, sustainable agriculture, and the understanding of plant life.

Course Outcomes for B.Sc. Zoology:

- Understanding of animal structure and function: Students will develop a comprehensive understanding of animal structure, including cells, tissues, organs, and organ systems. They will learn about the morphology, anatomy, and physiology of animals, including their growth, development, and physiological processes.
- Knowledge of animal diversity: Students will acquire knowledge of animal diversity, including the classification, identification, and nomenclature of different animal groups. They will study the major animal taxa, including protozoa, porifera, cnidaria, platyhelminthes, annelida, mollusca, arthropoda, echinodermata, and chordata, and understand their evolutionary relationships.
- Understanding of animal behavior and ecology: Students will gain an understanding of animal behavior, including their social interactions, communication, and reproductive behaviors. They will learn about ecological concepts, such as population dynamics, community interactions, and ecosystem structure. They will explore the impact of environmental factors on animal behavior and distribution.
- Proficiency in laboratory techniques: Students will develop practical skills in laboratory techniques relevant to zoology. They will learn animal collection, preservation, and identification methods. They will gain proficiency in microscopy, dissection techniques, physiological experiments, and molecular biology techniques used in zoology research.
- Knowledge of animal physiology and adaptations: Students will study the physiological processes of animals, including digestion, respiration, circulation, excretion, and sensory systems. They will understand the adaptations of animals to various environments, such as extreme temperatures, aquatic habitats, and terrestrial habitats.
- Awareness of animal conservation and ethics: Students will explore the conservation of animal species and habitats. They will understand the importance of biodiversity


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conservation, endangered species, and conservation strategies. They will be aware of the ethical considerations and responsible practices in zoological research and animal handling.

- **Research and data analysis skills:** Students will develop skills in conducting zoological research, including experimental design, data collection, and statistical analysis. They will learn to analyze and interpret scientific data, critically evaluate research findings, and communicate their results effectively.
- **Effective communication of zoological knowledge:** Students will enhance their communication skills to effectively convey zoological knowledge. They will learn to present scientific information, research findings, and zoological concepts in oral and written forms. They will develop skills in scientific writing, report preparation, and presentation techniques specific to zoology.
- **Application of zoology in interdisciplinary contexts:** Students will understand the application of zoological knowledge in interdisciplinary contexts. They will explore the connection between zoology and fields such as medicine, conservation biology, environmental science, and biotechnology. They will be able to analyze and solve problems related to these applications.
- **Lifelong learning and professional development:** Students will develop a commitment to lifelong learning and professional development in the field of zoology. They will recognize the importance of staying updated with advancements in zoological research, engaging in continuous learning, and pursuing further education or career opportunities in academia, research, industry, or other zoology-related fields.

Conclusion: The B.Sc. Zoology program aims to provide students with a comprehensive understanding of animal biology and equip them with the knowledge, skills, and attitudes necessary for success in the field. By achieving the course outcomes outlined above, students will develop a strong foundation in animal structure, function, diversity, behavior, and adaptations. They will gain proficiency in laboratory techniques, research skills, and effective communication of zoological knowledge. They will be prepared for further studies in zoology or related fields, research positions, or careers in industries that require zoological expertise. They will contribute to scientific advancements, conservation efforts, environmental sustainability, and the understanding of animal life.

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III. Program Outcomes for M.Sc.:


Program Outcomes for M.Sc. in Physics, Chemistry, Mathematics, and Zoology:

First Year:

- Comprehensive understanding of core concepts: Students will develop a comprehensive understanding of the core concepts, theories, and principles in their respective fields of study, including physics, chemistry, mathematics, and zoology. They will grasp the foundational knowledge necessary for advanced studies and research in their chosen disciplines.
- Proficiency in research methodologies: Students will acquire proficiency in research methodologies specific to their fields of study. They will learn to formulate research questions, design experiments, collect and analyze data, and interpret research findings. They will also develop skills in literature review, data presentation, and scientific writing.
- Advanced theoretical knowledge: Students will gain advanced theoretical knowledge in their respective disciplines, including advanced topics and specialized areas of study. They will explore the latest developments and advancements in their fields and understand the current trends and research directions.
- Practical and experimental skills: Students will develop practical and experimental skills relevant to their fields of study. They will gain hands-on experience in laboratory techniques, data collection, and analysis. They will also learn to use advanced scientific instruments and software tools commonly used in research and analysis.
- Critical thinking and problem-solving abilities: Students will enhance their critical thinking and problem-solving abilities through the application of theoretical knowledge and experimental skills. They will learn to analyze complex problems, identify alternative solutions, and evaluate their feasibility. They will develop the ability to think creatively and apply innovative approaches to problem-solving.


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- Effective communication of scientific information: Students will improve their communication skills to effectively convey scientific information. They will learn to present their research findings, theories, and concepts in oral and written forms. They will develop skills in scientific writing, report preparation, and presentation techniques specific to their disciplines.
- Ethical and responsible scientific practices: Students will understand the ethical considerations and responsible practices in scientific research and applications. They will adhere to professional ethics, safety protocols, and environmental regulations while conducting experiments and working with hazardous materials. They will also consider the societal impact of their research and practice responsible conduct.

Second Year:

- Specialization in chosen areas: Students will have the opportunity to specialize in their chosen areas of interest within their respective disciplines. They will explore advanced coursework and research opportunities in specialized subfields, allowing them to develop expertise and in-depth knowledge in specific areas.
- Advanced research and analytical skills: Students will further develop their research and analytical skills through advanced coursework and independent research projects. They will engage in data analysis, interpretation, and synthesis to draw meaningful conclusions and contribute to the existing body of knowledge in their disciplines.
- Interdisciplinary knowledge and collaboration: Students will have the opportunity to engage in interdisciplinary learning and collaboration. They will explore connections between their disciplines and other fields of study, fostering a multidisciplinary approach to problem-solving and research. They will develop skills in interdisciplinary collaboration and communication.
- Professional development and career readiness: Students will be prepared for professional development and career opportunities in academia, research, industry, or other relevant sectors. They will acquire transferable skills, such as project management, teamwork, leadership, and adaptability. They will develop a mindset for lifelong learning and continuous professional development.
- Research dissemination and publication: Students will learn to disseminate their research findings through conferences, seminars, and scholarly publications. They will gain experience in presenting their work to the scientific community, engaging in


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scientific discussions, and contributing to the advancement of knowledge in their respective fields.

- Integration of knowledge and application: Students will integrate their theoretical knowledge, research skills, and practical experiences to address complex scientific problems and real-world challenges. They will be able to apply their expertise to interdisciplinary contexts, contributing to scientific advancements, technological innovations, environmental sustainability, and societal well-being.

The M.Sc. programs in Physics, Chemistry, Mathematics, and Zoology aim to provide students with a deep understanding of their respective disciplines. By achieving the program outcomes outlined above, students will gain advanced theoretical knowledge, practical skills, and research competencies. They will develop critical thinking, problem-solving, and communication abilities essential for successful careers in academia, research, industry, or other relevant sectors. They will contribute to the advancement of knowledge, scientific discoveries, and applications in their fields of study.

IV. M.Sc. Course Outcomes


Name of the Program: Master of Science (M.Sc.)

Course Outcomes for M.Sc. Physics, First Year:

- Mastery of fundamental principles: Students will demonstrate a mastery of fundamental principles in classical mechanics, electromagnetism, quantum mechanics, statistical mechanics, and thermodynamics. They will understand the mathematical formulations and experimental evidence supporting these principles.
- Advanced mathematical techniques: Students will acquire advanced mathematical techniques necessary for solving complex problems in physics. They will develop proficiency in differential equations, vector calculus, linear algebra, complex analysis, and numerical methods.


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- Experimental skills and techniques: Students will develop proficiency in experimental skills and techniques relevant to physics. They will learn to set up and operate sophisticated laboratory equipment, collect accurate data, analyze experimental results, and draw meaningful conclusions.
- Quantum mechanics and its applications: Students will gain an in-depth understanding of quantum mechanics, including wave-particle duality, wave functions, operators, and quantum measurements. They will explore its applications in atomic, molecular, and condensed matter physics.
- Electromagnetism and optics: Students will delve into advanced topics in electromagnetism, including Maxwell's equations, electromagnetic waves, and electromagnetic fields in matter. They will study optics, including wave optics, interference, diffraction, and polarization phenomena.
- Statistical mechanics and thermodynamics: Students will develop an understanding of statistical mechanics and thermodynamics, including the laws of thermodynamics, thermodynamic potentials, kinetic theory, and applications to gases, liquids, and solids.
- Computational physics: Students will gain proficiency in computational physics techniques, including numerical simulations, data analysis, and modeling. They will utilize computational tools and software to solve complex physics problems and analyze experimental data.

Course Outcomes for M.Sc. Physics, Second Year:

- Advanced quantum mechanics: Students will explore advanced topics in quantum mechanics, such as quantum field theory, scattering theory, and relativistic quantum mechanics. They will analyze the mathematical formulations and applications of these concepts.
- Solid-state physics: Students will delve into the principles of solid-state physics, including crystal structures, electronic band theory, semiconductors, superconductivity, and magnetism. They will understand the properties and behavior of materials at the atomic and molecular levels.


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- Nuclear and particle physics: Students will study nuclear physics, including nuclear models, radioactive decay, and nuclear reactions. They will explore particle physics, including elementary particles, particle interactions, and the Standard Model of particle physics.
- Astrophysics and cosmology: Students will gain knowledge of astrophysics and cosmology, including stellar astrophysics, galaxy formation, cosmological models, and the origin of the universe. They will understand the observational methods and theoretical frameworks used in these fields.
- Advanced laboratory techniques: Students will develop advanced laboratory techniques and experimental skills relevant to their chosen specialization within physics. They will design and conduct sophisticated experiments, analyze complex data sets, and interpret experimental results.
- Research methodology and scientific writing: Students will learn research methodology, including literature review, hypothesis formulation, research design, and data analysis. They will develop scientific writing skills, including writing research papers, reports, and proposals adhering to professional standards.
- Seminar presentations and scientific communication: Students will enhance their presentation and communication skills through seminar presentations and scientific discussions. They will effectively communicate complex physics concepts, research findings, and scientific ideas to diverse audiences.
- Independent research project: Students will undertake an independent research project, applying the knowledge and skills acquired throughout the program. They will conduct original research, analyze data, interpret results, and communicate their findings through a thesis or research paper.


Course Outcomes for M.Sc. Chemistry:

First Year:

- Advanced understanding of core concepts: Students will develop an advanced understanding of core concepts in chemistry, including organic, inorganic, physical, and analytical chemistry. They will grasp the fundamental theories, principles, and mechanisms governing chemical reactions, structures, and properties.
- Proficiency in laboratory techniques: Students will acquire proficiency in laboratory techniques relevant to chemistry. They will gain hands-on experience in synthesizing compounds, analyzing chemical reactions, and characterizing materials using


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advanced instrumentation and methods. They will develop skills in data interpretation and analysis.


- Research methodology and literature review: Students will learn research methodologies and techniques specific to chemistry. They will understand how to design experiments, collect and analyze data, and interpret research findings. They will also develop skills in conducting literature reviews to identify and evaluate existing scientific literature.
- Specialization in subfields: Students will have the opportunity to specialize in subfields of chemistry based on their interests. They will explore advanced coursework in areas such as organic synthesis, inorganic materials, spectroscopy, computational chemistry, and analytical methods. They will gain in-depth knowledge and expertise in their chosen areas.
- Critical thinking and problem-solving skills: Students will enhance their critical thinking and problem-solving skills by applying their knowledge of chemistry to analyze and solve complex scientific problems. They will learn to evaluate experimental data, propose hypotheses, and develop strategies to address scientific challenges.
- Effective communication of scientific information: Students will improve their communication skills to effectively convey scientific information in oral and written forms. They will learn to present their research findings, theories, and concepts to both scientific and non-scientific audiences. They will develop skills in scientific writing, report preparation, and presentation techniques specific to chemistry.

Second Year:

- Advanced coursework and research projects: Students will engage in advanced coursework and independent research projects. They will have the opportunity to delve deeper into their chosen areas of specialization, conduct original research, and contribute to the existing body of scientific knowledge in chemistry. They will develop skills in experimental design, data analysis, and interpretation.
- Data analysis and interpretation: Students will further develop their skills in data analysis and interpretation. They will learn advanced statistical methods, computational techniques, and modeling approaches to analyze complex chemical data. They will be able to draw meaningful conclusions from experimental results and critically evaluate scientific literature.
- Interdisciplinary collaboration: Students will have the opportunity to collaborate with researchers from other disciplines or interdisciplinary teams. They will explore connections between chemistry and other fields, such as biology, materials science,


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environmental science, or pharmaceutical sciences. They will develop skills in interdisciplinary collaboration and communication.

- Publication and dissemination of research: Students will learn to disseminate their research findings through scientific publications, conference presentations, and posters. They will gain experience in writing research papers, following proper citation practices, and preparing scientific presentations. They will contribute to the scientific community and foster scientific discussions.
- Ethical conduct and safety practices: Students will understand the importance of ethical conduct and safety practices in chemical research. They will adhere to ethical guidelines, professional standards, and safety protocols in their laboratory work. They will prioritize the well-being of themselves, their colleagues, and the environment.
- Professional development and career readiness: Students will develop skills for professional development and career readiness in academia, research, industry, or other relevant sectors. They will acquire transferable skills, such as project management, teamwork, leadership, and communication. They will be prepared for further studies or career opportunities in the field of chemistry.


Course Outcomes for M.Sc. Mathematics:

First Year:

- Advanced Mathematical Concepts: Students will acquire a deep understanding of advanced mathematical concepts, including algebra, calculus, analysis, linear algebra, and number theory. They will be able to apply these concepts to solve complex mathematical problems.
- Rigorous Mathematical Proofs: Students will develop skills in constructing rigorous mathematical proofs. They will learn to apply logical reasoning and mathematical techniques to prove theorems and propositions in various areas of mathematics.
- Mathematical Modeling: Students will learn to formulate real-world problems into mathematical models. They will apply mathematical techniques to analyze and solve these models, providing insights into various phenomena and processes in fields such as physics, engineering, economics, and computer science.
- Advanced Mathematical Techniques: Students will gain proficiency in using advanced mathematical techniques, algorithms, and computational tools. They will be able to apply these techniques to solve complex problems and analyze large datasets.
- Mathematical Problem-solving Skills: Students will enhance their problem-solving skills by applying mathematical concepts and techniques to solve a wide range of


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mathematical problems. They will develop the ability to think critically, analyze problems, and devise appropriate strategies for problem-solving.


- **Mathematical Software and Programming:** Students will become proficient in using mathematical software and programming languages for mathematical computations, simulations, and data analysis. They will learn to leverage these tools to solve mathematical problems and explore mathematical concepts visually.
- **Mathematical Analysis and Optimization:** Students will develop skills in mathematical analysis and optimization techniques. They will learn to analyze functions, study their properties, and optimize mathematical models to find optimal solutions.
- **Mathematical Research and Literature:** Students will develop research skills in mathematics by studying and critically evaluating research papers and publications in the field. They will learn to identify gaps in existing knowledge, propose research questions, and conduct literature surveys.

Second Year:

- **Advanced Topics in Mathematics:** Students will explore advanced topics in mathematics, including areas such as differential equations, graph theory, functional analysis, probability theory, and mathematical logic. They will gain a deeper understanding of these topics and their applications.
- **Advanced Mathematical Techniques:** Students will further enhance their knowledge and proficiency in advanced mathematical techniques, including advanced calculus, abstract algebra, numerical methods, and mathematical optimization. They will apply these techniques to solve complex mathematical problems.
- **Mathematical Modeling and Simulation:** Students will engage in mathematical modeling and simulation of complex systems and phenomena. They will apply mathematical techniques to analyze and simulate dynamic systems, providing insights into their behavior and predicting their outcomes.
- **Research Project:** Students will undertake a research project in a specialized area of mathematics under the guidance of a faculty member. They will apply their theoretical knowledge, research skills, and mathematical techniques to address a specific research problem or question.
- **Presentation and Communication Skills:** Students will enhance their presentation and communication skills by effectively communicating mathematical concepts, research findings, and complex ideas to both technical and non-technical audiences. They will develop skills in delivering oral presentations, writing research papers, and preparing technical reports.


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- Collaborative and Interdisciplinary Skills: Students will develop skills in collaborative research and interdisciplinary approaches. They will work in teams, exchange ideas, and collaborate with researchers from other disciplines to solve complex problems and address real-world challenges.
- Professional Development and Career Readiness: Students will develop skills and attributes necessary for professional development and career success in academia, research, industry, or other relevant sectors. They will enhance their critical thinking, problem-solving, and analytical skills, as well as their ability to adapt to changing environments and work effectively in teams.
- Lifelong Learning: Students will develop a passion for lifelong learning and continuous professional development in mathematics. They will recognize the importance of staying updated with advancements in the field, engaging in self-directed learning, and pursuing further studies or research opportunities in mathematics or related disciplines.


Course Outcomes for M.Sc. Zoology:

First Year:

- Advanced knowledge of animal taxonomy and diversity: Students will gain advanced knowledge of animal taxonomy, including the classification, identification, and nomenclature of different animal groups. They will study the major animal taxa in detail and understand their evolutionary relationships. They will be able to classify and identify animals based on morphological and molecular characteristics.
- In-depth understanding of animal physiology: Students will develop an in-depth understanding of animal physiology, including the physiological processes and functions of different organ systems. They will study topics such as digestion, respiration, circulation, excretion, locomotion, and sensory systems in detail. They will comprehend the physiological adaptations of animals to different environments.
- Knowledge of animal behavior and ethology: Students will study animal behavior and ethology, including the social interactions, communication, and reproductive behaviors of animals. They will learn about the ecological and evolutionary aspects of behavior, including foraging, mating, territoriality, and parental care. They will analyze and interpret behavioral patterns and understand the underlying mechanisms.


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- Advanced concepts in animal ecology and conservation: Students will delve into advanced concepts in animal ecology, including population dynamics, community interactions, and ecosystem functioning. They will learn about ecological theories and models and apply them to real-world scenarios. They will understand the principles and strategies of animal conservation, including conservation genetics and management techniques.
- Research methods and experimental design: Students will gain proficiency in research methods and experimental design specific to zoology. They will learn to formulate research questions, design experiments, collect and analyze data, and interpret research findings. They will also develop skills in fieldwork, data collection techniques, and statistical analysis.
- Advanced knowledge in specialized areas of zoology: Students will have the opportunity to explore specialized areas of zoology based on their interests and career goals. They will study advanced topics in areas such as marine biology, entomology, animal physiology, animal behavior, conservation biology, and evolutionary biology. They will gain expertise in their chosen areas through coursework and research.

Second Year:

- Specialization in chosen areas of zoology: Students will have the opportunity to specialize in their chosen areas of interest within zoology. They will engage in advanced coursework, seminars, and research projects in their specialized fields. They will deepen their knowledge and expertise in specific sub disciplines of zoology.
- Advanced research and data analysis: Students will conduct independent research projects and gain experience in advanced data collection, analysis, and interpretation. They will develop skills in data management, statistical analysis, and scientific writing. They will critically evaluate research findings and contribute to the existing body of knowledge in their specialized areas.
- Interdisciplinary approaches in zoological research: Students will explore interdisciplinary approaches in zoological research and collaborate with researchers from other disciplines. They will integrate knowledge from different fields to address


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complex research questions and solve interdisciplinary problems. They will enhance their ability to communicate and collaborate effectively across disciplines.

- Publication and presentation of research findings: Students will learn to disseminate their research findings through scholarly publications and presentations at conferences and seminars. They will develop skills in scientific writing, manuscript preparation, and oral presentation techniques. They will contribute to the scientific community and communicate their research outcomes effectively.
- Professional development and career readiness: Students will be prepared for professional development and career opportunities in academia, research institutions, government agencies, conservation organizations, or other relevant sectors. They will acquire transferable skills such as project management, scientific communication, teamwork, and leadership. They will develop a mindset for lifelong learning and continuous professional growth.
- Integration of knowledge and application: Students will integrate their knowledge of zoology, research skills, and practical experiences to address complex scientific problems and real-world challenges. They will apply their expertise to interdisciplinary contexts, contributing to scientific advancements, conservation efforts, environmental sustainability, and the understanding of animal life.

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