

Master of Science **(Cancer Biology)**

Program Outcomes

At the end of the programme students will be able to:

PO 1 - Comprehensive Understanding of Cancer Biology:

Demonstrate a comprehensive understanding of the principles, theories, and practical applications related to molecular, cellular, and systemic aspects of MSc Cancer Biology.

PO 2 - Application of Critical Thinking and Problem-Solving in healthcare and research:

Apply critical thinking skills to analyse complex healthcare research challenges within the realm of Cancer Biology. They will use evidence-based decision-making and innovative problem-solving techniques to address diverse issues in cancer research and treatment.

PO 3 - Effective Communication in Healthcare Settings:

Communicate effectively, both in written and verbal forms, demonstrating the ability to interact professionally with patients, colleagues, interdisciplinary teams, and other stakeholders in varied healthcare settings and research institutes related to Cancer Biology (MSc).

PO 4 - Leadership and Collaboration in Healthcare:

Assume leadership roles in healthcare administration, research, or clinical practice. They will demonstrate the ability to lead and collaborate with diverse teams, contributing to the advancement of Cancer Biology (MSc) and allied healthcare disciplines.

PO 5 - Ethical Practice and Social Responsibility in Healthcare:

Uphold ethical standards in their professional practice, respecting the rights and dignity of individuals. They will demonstrate a commitment to social responsibility by advocating for health equity, diversity, and the overall well-being of the communities they serve.

PO 6 - Application of Specialized Techniques in Cancer Research:

Apply specialized techniques in genetic engineering, molecular biology, and bioinformatics to contribute to advancements in cancer research, acquiring

hands-on experience through internships, laboratory courses, and research methodologies.

PO 7 - Evaluation of Societal and Ethical Implications of Cancer Research:

Evaluate the societal and ethical implications of cancer research and treatment. They will address issues related to informed consent, privacy, access to care, and other ethical considerations, developing a holistic understanding of the societal impact of cancer biology research.

Program Specific Outcomes

At the end of the programme students will be able to:

PSO 1: Demonstrate proficiency in essential laboratory techniques, including cell culture, molecular biology, and advanced analytical methods used in cancer research.

PSO 2: Cultivate innovative thinking, Transdisciplinary approach and entrepreneurship by proposing creative solutions to project challenges, integrating theoretical knowledge with practical applications.

PSO 3: Exhibit proficiency in applying theoretical knowledge and practical skills acquired during coursework to address specific challenges encountered during I house projects.

Course Outcomes

Semester: 1

Subject	Course Outcome
Cell and Molecular Biology	<p>CO1. Acquire basic knowledge about the cell structure and function.</p> <p>CO2. Assess the role played by signaling molecules in cell-cell communication.</p> <p>CO3. Illustrate the ways by which prokaryotes and eukaryotes replicate and transcribe their DNA.</p> <p>CO4. Analyze the process resulting in production of proteins and their maintenance in the cell.</p> <p>CO5. Apply the knowledge of cell biology to understand the dynamics of cancer cells.</p>
Bioinformatics	<p>CO1. Analyse data handling process and data retrieval process from different biological databases.</p> <p>CO2. Understand the sequence-based Database Searches: BLAST and FASTA algorithms, various versions of basic BLAST and FASTA.</p> <p>CO3 Understand the concepts and overview for Bioinformatics for solving biological problems.</p> <p>CO4 Retrieval of biological data from different public domain database.</p> <p>CO5 Analyse evolutionary link among various organisms</p>
Concepts in Biological Chemistry	<p>CO1. Understand the metabolic pathways and regulations happening in the biological systems</p> <p>CO2. Determine the deficiencies associated with biomolecules and their management</p> <p>CO3. Demonstrate the extraction, separation and purification of proteins from various sources</p> <p>CO4. Explain the kinetic behaviour of the enzymes and their inhibitors</p> <p>Apply the basic knowledge for preparation of the solutions and buffers</p>
Microbiology in Human Health	<p>CO1. Develop insights to understand microorganism categorization and nomenclature procedures</p> <p>CO2. Discover different aspects of management of infectious diseases.</p> <p>CO3. Develop comprehensive knowledge of various aspects of microbiology with relevance to human health and disease</p> <p>Demonstrate various laboratory methods for bacteriological analysis</p>

Semester: 2

Subject	Course Outcome
Biomedical Instrumentation	<p>CO1.To provide students with a thorough understanding of genome engineering and editing techniques, such as CRISPR-Cas9, TALENs, and zinc finger nucleases.</p> <p>CO2.To familiarize students with the applications of these techniques in various areas of biomedicine, such as genetic disease therapy, drug discovery, and regenerative medicine.</p> <p>CO3.To teach students how to design and execute experiments using these instrumentation techniques and how to analyze and interpret the resulting data.</p> <p>CO4.To encourage students to critically evaluate the ethical and societal implications of genome engineering and editing.</p> <p>CO5.To prepare students for advanced research and professional careers in biomedicine, genetic engineering, and related fields.</p>
Molecular Oncology-I	<p>CO1.Understanding the molecular and genetic basis of cancer, including the role of mutations, gene regulation, and signaling pathways in the development and progression of cancer.</p> <p>CO2. Familiarity with the latest advancements in cancer research and treatment, including precision medicine, immunotherapy, and targeted therapy.</p> <p>CO3. Knowledge of the laboratory techniques used to study the molecular basis of cancer, including DNA sequencing, microarray analysis, and proteomics.</p> <p>CO4. Ability to critically evaluate and interpret the scientific literature in the field of molecular oncology.</p> <p>Understanding of the ethical, social, and policy implications of advances in molecular oncology, including genetic testing and personalized medicine.</p>
Pathology & Immunology	<p>CO1. Understand the diseases and their pathogenesis.</p> <p>CO2.Gain basic knowledge on the organ specific pathologic processes</p> <p>CO3.Illustrate various mechanisms that regulate immune responses and immunotolerance</p> <p>CO4.Compare and contrast innate and adaptive immunity.</p> <p>Apply the Immunotechnology for diagnostics purpose</p>
Oncopharmacology	<p>CO1. Describe the principles of pharmacokinetics and pharmacodynamics and their application in oncology drug development.</p> <p>CO2. Understand the mechanism of action of different types of anticancer drugs, including chemotherapy, targeted therapy, immunotherapy, and hormonal therapy.</p> <p>CO3. Analyze the clinical data of oncology drugs and evaluate their efficacy and safety profiles.</p>

	<p>CO4. Understand the principles of drug resistance and the strategies to overcome drug resistance.</p> <p>CO5. Understand the challenges of drug development in oncology, including clinical trial design and regulatory approval processes</p>
<p>Lab Course - Molecular and Immunology</p>	<p>CO1. To demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures</p> <p>CO2. To understand the basic microbial structure and function and study the comparative characteristics and also understand the structural similarities and differences among various physiological groups of bacteria</p>

Semester: 3

Subject	Course Outcome
<p>Animal Cell Culture & Cell Engineering</p>	<p>CO1. To develop understanding of basic principles underlying in vitro techniques for culture of animal and human cells and their genetic manipulation for better understanding of human diseases.</p> <p>CO2. To comprehend the fundamental concepts of animal cell culture, and its importance.</p> <p>CO3. To discuss the significance of transgenesis with reference to animal models.</p> <p>CO4. To explain the principles and applications of animal cloning and gene therapy along with ethical concerns.</p> <p>CO5. To have laboratory experience of techniques used in culture establishment and maintenance of animal and human cells, and genetic manipulation of cells.</p>
<p>Medical Genetics & Gene Therapy</p>	<p>CO1. Comprehensive understanding of the various approaches, types, and mechanisms of gene therapy.</p> <p>CO2. Explore immune responses to gene therapy vectors and strategies to regulate these responses</p> <p>CO3. Understand the phases in the development of biomarkers and the metrics used to evaluate their performance</p> <p>CO4. Grasp the basics of DNA as genetic material, including its structure, genetic code, and flow of genetic material</p> <p>CO5. Explore sex determination, dosage compensation, and genetic</p>

Molecular Oncology II	<p>CO1.Understanding of the basic biology of cancer cells and how they differ from normal cells.</p> <p>CO2. Knowledge of the molecular and genetic changes that lead to the development of cancer and how these changes can be targeted by therapies.</p> <p>CO3. Familiarity with the different types of cancer, including their causes, symptoms, diagnosis, and treatment options.</p> <p>CO4. Understanding of the role of the immune system in cancer and how immunotherapy is being used to treat cancer.</p> <p>CO5. Knowledge of the various diagnostic tools and techniques used to detect and monitor cancer, such as imaging tests, biopsy, and molecular testing.</p>
Molecular Modelling & Drug Design	<p>CO1.Understand the theoretical foundation of computational chemistry, with an emphasis on electronic structure calculations using quantum chemistry and classical molecular dynamics simulation techniques.</p> <p>CO2. Use computational chemistry software to simulate chemical processes, quantify and rationalize reactivity, and study reaction mechanisms.</p> <p>CO3. Comprehend the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations.</p> <p>CO4. Realize the concepts of bioavailability and bioequivalence of drug products and their significance</p> <p>CO5. To Know the chemistry of drugs with respect to their biological activity</p>
Research Methodology and Biostatistics	<p>CO1. To understand the importance of ethical considerations in research and be able to implement good laboratory practices.</p> <p>CO2.To calculate and interpret demographic measures such as mortality and fertility rates, and population growth rates.</p> <p>CO3.To apply their knowledge of research methodology to critically evaluate existing research findings and formulate new research questions.</p>

Semester: 4

Subject	Course Outcome
Bioethics, Safety, and Intellectual Property Rights	<p>CO1.To analyze the basic principles and legal framework of intellectual property rights and its application to biotechnology.</p> <p>CO2.To interpret the concept of bioethics and analyze bioethical issues involved in the application of intellectual property rights</p> <p>CO3.To comprehend the laws, regulations and guidelines relating to bio-safety in relation to the handling of biological</p>