Program Specific Outcomes

Name of Program: M. Sc. Biotechnology

No of Courses: 20

Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Communication, Skills, Teamwork, Moral and Ethical Awareness

	Graduate Attribute	Program Specific Outcomes
PSO1	Disciplinary Knowledge	Capable of demonstrating basic & comprehensive knowledge by critically & clearly understanding major concepts, principles, theories, techniques related to Biotechnology also creatively applying the related skills for industrial application.
PSO2	Critical Thinking	Inculcate the ability to engage in reflective & independent thinking for analyzing, formulating & tackling problems related to the field of biotechnology.
PSO3	Problem Solving	Develop the capacity to extrapolate from what one has learned & apply their proficiencies towards problem solving approach as well as formulating search strategies for searching information of biotechnology.
PSO4	Analytical Reasoning	Able to think logically, trace out drawbacks in the arguments of others, analyze the data, and able to draw significant conclusions of the biotechnological aspect.
PSO5	Research Related Skill	Identify problems, formulate hypothesis, give justifications for solutions by intensive research, critical analysis & laboratory investigations, using appropriate research related biotechnological skill to develop sustainable product & report accurately the findings in the form of a patent or publication.
PSO6	Communication Skills	Ability to interact & execute complex biotechnological ideas along with thoughts in writing & orally to express their acquaintance in clear & concise manner.
PSO7	Cooperation / Team Work	Perform effective coordination either individually or in group to perform given task in timely manner, sharing workload, meet deadlines with high level of interdependence to establish trust, taking challenges & improvising performance through team work to produce constructive biotechnological outcome.
PSO8	Scientific Reasoning	Achieve logical relation between ideas & fetch the inference from qualitative / quantitative data to prove the biotechnological hypothesis scientifically.
PSO9	Reflective Thinking	Able to construct, evaluate assumptions to give justifications for implications and develop critical sensibility to enhance experiences for self & societal awareness related to biotechnology.

PSO10	Information / Digital Literacy	Capable of using digital resources for collecting literature, analyzing & evaluating relevant information efficiently on biotechnology course/ research findings with effective communication to give applicable outcome.
PSO11	Self-Directed Learning	Develop initiative to learn independently to generate effective ideas, screen for critical literature, identify appropriate resources by effective time management for problem based learning, dissertation & laboratory work which provides a foundation for future leadership roles in biotechnology.
PSO12	Multicultural Competence	Acquire the values, beliefs by interacting & engaging effectively in a socio-cultural group of biotechnology, globally.
PSO13	Moral & Ethical Awareness/ Reasoning	Demonstrating moral & ethical issues, dilemmas related to IPR, copyright, plagiarism, legal compliance, quality control, transparency & accountability to form unbiased multiprospective appreciating culture for biotechnology related aspects.
PSO14	Leadership Readiness / Qualities	Ability to influence, motivate, accept challenges, coordinate & lead the team for achieving success/ goal in the field of biotechnology.
PSO15	Lifelong Learning	Develop self –sustainability, positive attitude, competitiveness, employability for improving creativeness, knowledge, skills & to meet socio-economic objective for creating better opportunities to improve personal as well as professional quality of life in the biotechnological field.

Program Matric

Name of Program: M. Sc. Biotechnology

(Low Correlation= L/1; Moderate Correlation= M/2; High Correlation= H/3)

Course Outcome (COs)		Program Specific Outcomes (PSOs)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Course Name: (Sem-I)	Cell Biology & Enzymology														
CO1 (T)	Explain the various types of cell organelles & molecular events in plant & animal cell system.	H	H	M	H	H	M	L	H	H	M	H	L	M	L	H
CO2 (T)	Illustrate basic enzymology and basic aspects of enzyme kinetics.	H	H	H	H	H	M	L	H	H	M	M	L	L	L	H
	Course Name:	Molecular Biology														

CO1 (T)	Demonstrate the comprehensive knowledge of DNA replication and transcription process in prokaryotic & eukaryotic.	H	H	M	H	H	H	M	H	H	H	M	L	L	M	H
CO2 (T)	Determine the prokaryotic & eukaryotic protein biosynthesis & its regulation.	H	H	M	H	H	H	L	H	H	H	M	L	L	M	H
	Course Name:	**Biomolecules**														
CO1 (T)	Define structure, function and properties of biomolecules such as carbohydrates, lipids, proteins & nucleic acid.	H	H	M	H	H	H	L	H	H	M	M	L	L	H	H
CO2 (T)	Apply the knowledge of biomolecules for advanced studies and understand protein sequencing, protease mapping, protein folding and Ramachandran plot.	H	H	H	H	H	H	M	H	H	H	H	L	M	M	H
	Course Name:	**Biophysical Techniques**														
CO1 (T)	Develop aptitude about the principle and working of various biophysical techniques & instrumentation for characterization of biomolecules.	H	H	H	H	H	H	L	H	H	M	H	L	L	M	H
CO2 (T)	Perform qualitative and quantitative analysis of biological sample using different techniques necessary in biotechnology industry.	H	H	H	H	H	H	M	H	H	L	M	L	L	M	H
	Course Name: Practical (Lab-I)															
CO1 (P)	Demonstrate various techniques of cell biology & enzymology practically.	H	H	H	H	H	H	H	H	H	H	H	L	L	H	H
	Course Name: Practical (Lab-II)	**Macromolecules & Analytical Techniques**														

CO2 (P)	Perform practical applications of macromolecules & analytical techniques.	H	H	H	H	H	H	H	H	H	H	H	L	L	H	H
	Course Name: (Sem-II)	**Microbiology**														
CO1 (T)	Define the general characteristics, taxonomy of microbes including viruses, viriods, prions and its applications in biotechnology.	H	H	H	H	H	H	H	H	H	M	H	L	L	M	H
CO2 (T)	Acquire through knowledge of microbial physiology, growth and its control.	H	H	H	H	H	H	H	H	H	M	H	L	L	M	H
	Course Name:	**Immunology**														
CO1 (T)	Define and corelate fundamental concepts of basic immunology and vaccinology.	H	H	H	H	H	H	H	H	H	M	H	L	M	L	H
CO2 (T)	Develop understanding of clinical immunology essential for medical diagnosis.	H	H	H	H	H	H	H	H	H	H	H	L	M	L	H
	Course Name:	**Fundamentals of Genetic Engineering**														
CO1 (T)	Infer tools and techniques used in Genetic Engineering.	H	H	H	H	H	H	H	H	H	H	H	L	H	M	H
CO2 (T)	Learn Genomic DNA library construction and various DNA sequencing techniques.	H	H	H	H	H	H	H	H	H	H	H	L	H	M	H
	Course Name:	**Applied Molecular Biology**														
CO1 (T)	Understand the concept of recombination, molecular mapping of genome, Antisense, Ribozymes and Epigenetics.	H	H	H	H	H	H	H	H	H	M	H	L	L	L	H
CO2 (T)	Study cancer biology, angiogenesis, metastasis and basic idea of cancer	H	H	H	H	H	H	H	H	H	H	H	L	L	M	H

	stem cells.															
	Course Name: Practical (Lab-I)	**Microbiology & Immunology**														
CO1 (P)	Demonstrate hands on experiences of microbiology & immunology.	H	H	H	H	H	H	H	H	H	M	H	L	L	H	H
	Course Name: Practical (Lab-II)	**Genetic Engineering & Applied Molecular Biology**														
CO2 (P)	Perform basic & advanced techniques of genetic engineering & applied molecular biology.	H	H	H	H	H	H	H	H	H	H	H	L	L	L	H
	Course Name: (Sem-III)	**Genetic Engineering & its Application**														
CO1 (T)	Summarize the transformation & transfection techniques for gene delivery.	H	H	H	H	H	H	H	H	H	H	H	L	H	L	H
CO2 (T)	Comprehend heterologous gene expression and protein engineering technology.	H	H	H	H	H	H	H	H	H	H	H	L	M	L	H
	Course Name:	**Plant Biotechnology**														
CO1 (T)	Thorough understanding of tissue culture techniques for the production of superior quality hybrid crop plant and increased yield.	H	H	H	H	H	H	H	H	H	M	H	L	H	M	H
CO2 (T)	Practice plant metabolic engineering to produce industrially important bioactive compounds.	H	H	H	H	H	H	H	H	H	M	H	L	M	M	H
	Course Name:	**Industrial Biotechnology I (Core Elective A)**														
CO1 (T)	Execute principal and working of different types of bioreactors.	H	H	H	H	H	H	H	H	H	M	H	L	L	M	H
CO2 (T)	Apply downstream processing for bioprocess economics.	H	H	H	H	H	H	H	H	H	L	H	L	L	L	H
	Course Name:	**Environmental Biotechnology I (Core Elective B) Environmental Science & Bioresources**														
CO1 (T)	Understand environment, its resources like biofuels, energy and	H	H	H	H	H	H	H	H	H	L	H	L	L	L	H

	importance of its protection.															
CO2 (T)	Formulate biofertilizers and biopesticides to mimic the use of chemical fertilizers for sustainable agriculture practices.	H	H	H	H	H	H	H	H	H	M	H	L	L	L	H
	Course Name:	Introductory Biotechnology (Foundation I)														
CO1 (T)	Understand the structure, function, types and inter-connection between protein, enzymes, nucleic acid, genes & chromosomes.	H	H	H	H	H	H	H	H	H	M	H	L	L	L	H
CO2 (T)	Meet the challenges that come in newly emerging biotechnological investigations.	H	H	H	H	H	H	H	H	H	M	H	L	L	L	H
	Course Name:	Diagnostic Medical Biotechnology (Core Subject Centric I)														
CO1 (T)	Understand concept of genomics & host pathogen interactions in disease progression and their clinical diagnosis.	H	H	H	H	H	H	H	H	H	H	H	L	H	M	H
CO2 (T)	Address clinical proteomics and disease biomarkers using high throughput sequencing, microarray, and nanomolecular diagnostics techniques.	H	H	H	H	H	H	H	H	H	H	H	L	H	M	H
	Course Name: Practical (Lab-I)	Genetic Engineering & Plant Biotechnology														
CO1 (P)	Apply genetic engineering & plant biotechnology techniques.	H	H	H	H	H	H	H	H	H	H	H	L	L	H	H
	Course Name: Practical (Lab-II, A+B)	Industrial Biotechnology & Environmental Biotechnology														
CO2 (P)	Experience various practical applications of industrial & environmental biotechnology.	H	H	H	H	H	H	H	H	H	M	H	L	L	H	H
	Course Name: (Sem-IV)	Animal Biotechnology														

CO1 (T)	Explain animal cell technology, characteristic and behaviour of cell in media.	H	H	H	H	H	H	H	H	H	M	H	L	H	L	H
CO2 (T)	Demonstrate knowledge of tissue engineering for commercial application.	H	H	H	H	H	H	H	H	H	M	H	L	L	M	H
	Course Name:	Biostatistics, Bioinformatics, Ethics & Patenting														
CO1 (T)	Understand the subject of biostatistics and bioinformatics for application in life sciences, public health and medicine.	H	H	H	H	H	H	H	H	H	H	H	L	L	L	H
CO2 (T)	Use knowledge of biosafety, bioethics and patenting for protecting rights in legal issues.	H	H	H	H	H	H	H	H	H	H	H	L	H	L	H
	Course Name:	**Industrial Biotechnology II (Core Elective B)**														
CO1 (T)	Explain the bioprocess engineering, optimization, biosensor technology concepts to scale up biopharmaceutical products.	H	H	H	H	H	H	H	H	H	M	H	L	M	M	H
CO2 (T)	Describe the production of primary and secondary metabolites for industrial application.	H	H	H	H	H	H	H	H	H	M	H	L	L	M	H
	Course Name:	Environmental Biotechnology II (Core Elective B) Applied Environmental Biotechnology														
CO1 (T)	Illustrate the scientific concepts of bioremediation, phytoremediation, bioabsorption and bioleaching of heavy metals.	H	H	H	H	H	H	H	H	H	M	H	L	L	L	H
CO2 (T)	Apply the knowledge of waste water treatment and xenobitics for environmental studies.	H	H	H	H	H	H	H	H	H	L	H	L	L	H	H
	Course Name:	**Basic rDNA Technology (Foundation II)**														
CO1	Describe basic process and	H	H	H	H	H	H	H	H	H	M	H	L	L	M	H

(T)	techniques in recombinant DNA technology.															
CO2 (T)	Explain gene cloning and its application.	H	H	H	H	H	H	H	H	H	M	H	L	M	M	H
	Course Name:	**Therapecutics and Drug Discovery**														
CO1 (T)	Explain gene therapy, proteomics and drug discovery.	H	H	H	H	H	H	H	H	H	H	H	L	L	M	H
CO2 (T)	Describe nanobiotechnology & clinical research for drug discovery.	H	H	H	H	H	H	H	H	H	H	H	L	M	M	H
	Course Name: Practical (Lab-I, Section-I)	**Animal Biotechnology, Biostatics, Bioinformatics, Ethics & Patenting**														
CO1 (P)	Demonstrate various techniques of animal biotechnology, biostatics, bioinformatics, ethics & patenting as well as able to solve the related problems.	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
	Course Name: **Practical (Lab-I, Section-II, A+B)**	Industrial Biotechnology or Environmental Biotechnology														
CO2 (P)	Utilize practical knowledge of industrial & environmental biotechnology.	H	H	H	H	H	H	H	H	H	L	H	L	M	H	H
	Total No of Occurrence Frequency	**48**	**48**	**48**	**48**	**48**	**48**	**46**	**48**	**48**	**48**	**48**	**02**	**27**	**48**	**48**
	Percentage Attributes	**05**	**05**	**05**	**05**	**05**	**05**	**4.79**	**05**	**05**	**05**	**05**	**0.20**	**2.81**	**05**	**05**
	Interpretation	High percentage of correlation was obtained for graduate attributes naming Graduate Attributes: Disciplinary Knowledge, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Communication Skills, Cooperation/Teamwork, Scientific Reasoning, Reflective Thinking, Information/ Digital Literacy, Self-Directed Learning, Leadership Readiness/ Qualities, Life Long Learning; which indicates that Biotechnology course comprises of all the major attributes. However, medium level of correlation was observed for graduate attribute of Moral and Ethical Awareness/ Reasoning. Besides, low percentage of correlation was obtained for graduate attribute of Multi cultural competence.														