

M.Sc. Biotechnology

Course Outcomes

M.Sc. Biotechnology is 4 semester course conducted by Hislop College, Nagpur as per the syllabus provided by Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur. Each semester students have to take four theory papers, two Practicals based on four theory papers and a Seminar. Fourth semester has a six month Research Project Work. Course work is according to theory paper, practicals and seminar conducted throughout the program.

M. Sc. BIOTECHNOLOGY

Semester I

Paper – I (Code: 1T1) Cell Biology and Enzymology

Course outcome

Students will be able to

- Remember and understand the structure and function cells, sub cellular organelles Cellular communication and Cell cycle.
- Remember and understand the Basic concepts of Enzymology and Enzyme Kinetics.
- Analyses the mathematical derivations in understanding enzyme kinetics and different transformation and its application.
- Understand the concept of Enzyme Engineering and immobilization

Paper – II (Code: 1T2) Molecular Biology

Course outcome

Students will be able to

- Remember and understand the fundamental concepts of Molecular Biology and the experiments involved in it.
- Relate the concepts of Molecular Biology in the development of Biotechnological experiments.

Paper – III (Code: 1T3) Biomolecules

Course outcome

Students will be able to

- Remember and understand the biochemistry and diversity of Carbohydrates, Proteins, Lipids and Nucleic acids.
- Recognize their importance in Biotechnological processes

Paper – IV (Code: 1T4) Biophysical Techniques

Course outcome

Students will be able to

- Remember and comprehend techniques and instrumentation involved in studying basic biological phenomenon focusing on Spectrophotometry, Chromatography, Electrophoresis, Centrifugation viscosity and radioactivity.
- Evaluate the application of each technique in providing solution to biotechnological problems.

LAB I (Code: 1P1) Cell Biology and Enzymology

Course outcome

Students will be able to

- Perform major experiments in cell biology and enzymology
- Work well and carefully in laboratory environment and with instruments

LAB II (Code: 1P2) Macromolecules & Analytical Techniques

Course outcome

Students will be able to

- Perform major basic in biochemistry
- Perform basic techniques in understanding biomolecules and Biophysical techniques.

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Semester II

Paper – I (Code: 2T1) Microbiology

Course outcome

Students will be able to

- Remember and Understand basic concepts of Microbiology
- Appreciate the diversity of microorganisms and their application in biotechnology.
- Comprehend the concept of chemotherapy and understand and evaluate the Drug resistance in Microbes.

Paper – II (Code: 2T2) Immunology

Course outcome

Students will be able to

- Remember and Understand basic concepts of Immunology.
- Appreciate and assess the various immunological techniques used for public health.

Paper – III (Code: 2T3) Fundamentals of Genetic Engineering

Course outcome

Students will be able to

- Remember and Understand fundamental concepts of Genetic Engineering
- Illustrate and compare different techniques involved in Genetic Engineering

Paper – IV (Code: 2T4) Applied Molecular Biology

Course outcome

Students will be able to

- Gain knowledge of Recombination and Genome Mapping and its application in Biotechnology
- Comprehend the concept of Antisense, Ribozymes and Epigenetics and there application
- Understand basic concept of Cancer Biology and stem cells.

LAB I (Code: 2P1) Microbiology & Immunology

Course outcome

Students will be able to

- Acquire basic Microbiology laboratory skills like bacterial pure culture isolation, microscopy and biochemical analysis of microbes
- Understand experiments in Immunology

LAB II (Code: 2P2) Genetic Engineering & Applied Molecular Biology

Course outcome

Students will be able to

- Acquire laboratory skills involved in Genetic Engineering and Molecular Biology.
- Understand the handling of laboratory instruments and chemicals involved in Genetic Engineering.

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Semester III

Paper – I (Code: 3T1) Genetic Engineering & its Applications

Course outcome

Students will be able to

- Understand the concepts of Prokaryotic and Eukaryotic Transformation and PCR
- Describe the expression of heterologous genes and the vectors involved in it.
- Appreciate technology involved in industrial products of Protein engineering.
- Explain and illustrate techniques like Phage display and gene therapy

Paper – II (Code: 3T2) Plant Biotechnology

Course outcome

Students will be able to

- Remember and understand the concept of Plant Biotechnology
- Differentiate between different plant tissue culture techniques.
- Comprehend different techniques to produce better crop via applying the principles of biotechnology
- Understand concepts of Plant Metabolic Engineering

Paper – III (Core Elective A) (Code: 3T3A) Industrial Biotechnology I

Course outcome

Students will be able to

- Remember and Understand the design and functioning of different types of Bioreactors and Downstream processing
- Evaluate the application of different types of Bioreactors including immobilization reactor system and its kinetics

Paper – III (Core Elective B) (Code: 3T3B) Environmental Biotechnology I

Course outcome

Students will be able to

- Remember and Understand the principles of Environmental Science & Bioresources

Paper – IV (Foundation Paper I) (Code: 3T4A) Introductory Biotechnology

This course is allowed for students of M.Sc. from subjects other than Biotechnology. Therefore the students in this course will be from field other than Biotechnology and will not have background of Biotechnology.

Course outcome

Students will be able to

- Comprehend the structure and function of macromolecules such as Proteins and Nucleic Acid and their arrangement in Cell
- Understand the concept of genes and enzymes

Paper-IV: (Core Subject Centric I) (Code: 3T4B) Diagnostic Medical Biotechnology Molecular and Nanomolecular Diagnostics

Students who are not opting for foundation course in any other subject (other than Biotechnology) can opt for this course.

Course outcome

Students will be able to

- Demonstrate an understanding of Disease Diagnostic technology under medical Biotechnology and Molecular and Nanomolecular Diagnostics

LAB I (Code: 3P1) Genetic Engineering & Plant Biotechnology

Course outcome

Students will be able to

- Skillfully perform basic experiments in Genetic engineering and plant Biotechnology
- Handle sophisticated laboratory equipment and reagents

LAB II (Core Elective A) (Code: 3P2) Industrial Biotechnology

Course outcome

Students will be able to

- Skillfully perform basic experiment in Industrial Biotechnology

LAB II (Core Elective B) (Code: 3P2) Environmental Biotechnology

Course outcome

Students will be able to

- Skillfully perform basic experiment in Environmental Biotechnology

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Semester IV

Paper – I (Code: 4T1) Animal Biotechnology

Course outcome

Students will be able to

- Remember and Understand the Fundamental Concepts of Animal Cell Culture techniques.
- Understand and envision the future Commercial aspects of Animal Cell culture

Paper – II (Code: 4T2) Biostatistics, Bioinformatics, Ethics & Patenting

Course outcome

Students will be able to

- Understand the underlined concepts of Biostatics, Bioinformatics, Ethics and patenting and its application in the field of Biotechnology

Paper – III (Core Elective A) (Code: 4T3A) Industrial Biotechnology II

Course outcome

Students will be able to

- Remember and Understand the advanced concept of Industrial Biotechnology
- Evaluate the production of Primary and Secondary Metabolite

Paper – III (Core Elective B) (Code: 4T3B) Environmental Biotechnology II Applied Environmental Biotechnology

Course outcome

Students will be able to

- Remember and Understand the advanced concept of Environmental Biotechnology and effects of xenobiotics in environment
- Evaluate the functioning of technology involved in Waste water treatment

Paper – IV (Foundation Paper II) (Code: 4T4A) Basic rDNA Technology

This course is allowed for students of M.Sc. from subjects other than Biotechnology. Therefore the students in this course will be from field other than Biotechnology and will not have background of Biotechnology.

Course outcome

Students will be able to

- Comprehend the basics of recombinant DNA Technology
- Understand the concept of gene cloning

Paper-IV: (Core Subject Centric II) (Code: 4T4B) Therapeutic Medical Biotechnology Molecular Therapeutics and Drug Discovery

Students who are not opting for foundation course in any other subject (other than Biotechnology) can opt for this course.

Course outcome

Students will be able to

- Understand and evaluate the fundamentals of Therapeutic Medical Biotechnology
- Illustrate the process of Drug Discovery and Clinical research

LAB I (Code: 4P1) Animal Biotechnology, Biostatistics, Bioinformatics, Ethics & Patenting And Industrial Biotechnology II or Environmental Biotechnology

Course outcome

Students will be able to

- Skillfully perform the experiments involving the fundamentals of Biostatistics, Bioinformatics, Animal Cell culture techniques and experiments related to the elective paper opted by them

Project (Code: 4PROJ1)

Every student is required to carry out a project work in semester IV. The project can be of following types. A) Experimental Project Work; OR B) Field Based Project Work; OR C) Review writing based Project Work.

Course outcome

Students will be able to

- Develop the critical thinking ability and communication skills.
- Understand and apply the scientific method.
- Develop the aptitude to work on a scientific problem and look for alternative solution.
- Write their finding in a form of a thesis and defend it by presenting it in front of their teachers and examiners.
- Experience and embrace the habit of ethical practice in performing experiments and communicating them

Seminar (Code: 1S1, 2S1, 3S1 and 4S1)

Class seminars are conducted every semester to develop communication skills of students. Students will be able to comprehend the current research and should be able to put forward major ideas in front of their colleagues and teachers. Students will be evaluated on the basis of their presentation and questions and answer session.

PO M. Sc (Biological Sciences/ Life Sciences)

The following Departments are included under Biological Sciences/Life Sciences:

- Biotechnology
- Botany
- Biochemistry
- Zoology

PO1. Courses offered in the Biological Sciences/ Life sciences give students a general understanding of the fundamental principles of life that extend from the tiniest microbes to plants, animals, and human beings.

PO2. Students can describe the structure and function of cellular components and explain how they interact in a living cell. They can also describe how cells interact to develop tissues and organs, and how these contribute to a functional organism.

PO3. Students can demonstrate an understanding of the mechanisms driving evolution, and can describe similarities and differences of the major taxonomic groups.

PO4. Students will become proficient in handling relevant scientific instruments and have a understanding of the principles of working.

PO5. Students can formally communicate the results of biological investigations using both oral and written communication skills.

PO6. Students also obtain the knowledge, skills, and motivation necessary to lifelong learning and problem solving attitude.

PO7. Specialized courses emphasizing teaching and research in various life science disciplines are also offered. Disciplines range from basic science to applied science.

M.Sc. Biotechnology (CBCS)

Program Specific Outcomes

On the completion of M.Sc. Biotechnology students must be able to

PSO1. Remember and Understand complex phenomenon in Life sciences and techniques in Biotechnology and apply this knowledge to understand the current scientific questions and find out the solution of complex scientific problems.

PSO2. Effectively communicate complex scientific concepts and his/her research to scientific community and general public. They must be able to understand and write scientific literatures and reports and make effective presentation.

PSO3. Exhibit their knowledge about recent development in the field of Biotechnology

PSO4. Be skillful to work in various sectors related to biotechnology like Pharmaceutical industries etc.

PSO5. Investigate of complex scientific problems and construct proposal for effective solution

PSO6. Be skillful in handling laboratory equipment and perform experiments in very controlled and systematic manner while taking care of instruments.

PSO7. Be aware of societal problems which can be solved by biotechnology and develop solution for it.

PSO8. Be sensitive towards environmental issues

PSO9. Practice ethical principles and bind to professional ethics and responsibilities and norms in every walks of life

PSO10. Work in as an individual as well as a team member.

PSO11. Develop the capacity of critical thinking and problem solving aptitude by virtue of taking research assignments.

PSO12. Be able to identify an area of scientific research, design, and carry out suitable experiments and document the results in a scientific manner.

PSO13. Cultivate the skill of collecting and analyzing information from various sources and interpreting them in form of experiments thus developing the habit of working independently.

PSO14. Demonstrate an ability to appear and clear entrance examinations and interviews for admissions to Ph.D courses in India and abroad.

B.Sc Biotechnology

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1.** Students will be able to design, conduct experiments, analyze and interpret data for investigating problems in Biotechnology and allied fields.
- PSO2. Demonstrate proficiency in basic science and foundation biotechnology course.
- PSO3. Demonstrate a working knowledge of advanced biological sciences.
- PSO4. Demonstrate competence in application of engineering principles to biological systems.
- PSO5. Demonstrate an ability to appear for National level examination to pursue higher studies.
- PSO6. Demonstrate practical and theoretical knowledge essential for pursuing higher studies. Several career opportunities are available for students with biotechnology background abroad especially in countries like Germany, Australia, Canada, USA and many more where biotechnology is a rapidly developing field after pursuing their higher education.
- PSO7. Demonstrate an ability to identify careers in biotechnology, domain like Pharmaceutical, Food Industry etc, and skills required to work in a biotechnology laboratory or manufacturing facility. Some of the major pharmaceutical and drug companies' hiring biotechnological professionals include Dabur, Ranbaxy, Hindustan Lever and Dr Reddy's Labs, food processing industries, chemical industry and textile industry as well. Beside this industries also employ biotechnological professionals in their marketing divisions to boost up business in sectors where their products would be required.
- PSO8. Entrepreneurship ventures such as consultancy and training centres can be opened