

GOVT. POSTGRADUATE COLLEGE, GUNA

Affiliated to Jiwaji University, Gwalior (M.P.)

Phone No.: 07542-251641

Email : hegpgcgun@mp.gov.in

Website : <https://highereducation.mp.gov.in/?orgid=179>

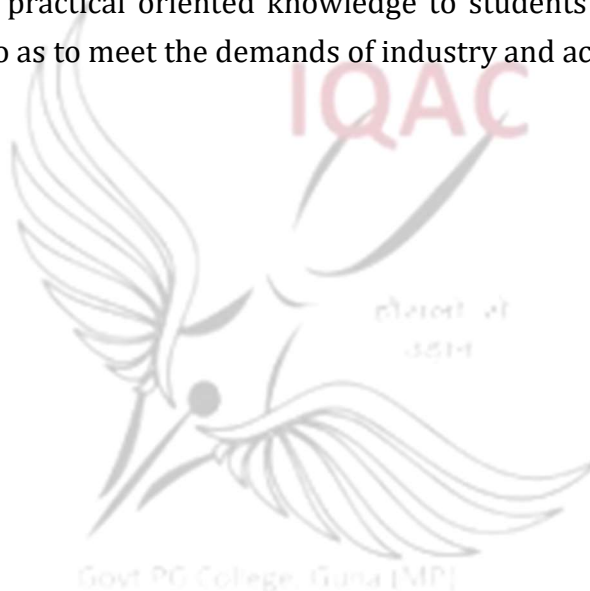


Bachelor of Science Subject: Biotechnology

Program Specific Outcomes

The course B.Sc. Biotechnology will help the students to-

1. Develop scientific temperament and social responsibilities
2. Gain an ability to apply biotechnological skills (molecular & microbiology, immunology & genetic engineering, bioprocess & fermentation, enzyme and food technology and bioinformatics) and its applications in core and allied fields
3. Empower in acquiring that how to imply biotechnology with other fields
4. Provide students with the concepts and research approaches for their higher career in the field of biotechnology and develop their scientific interest
5. Grasp of basic and advanced knowledge on various domains of biotechnology
6. Impart in-depth practical oriented knowledge to students in various thrust areas of biotechnology, so as to meet the demands of industry and academia



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I Year / Certificate Course

COURSE TITLE	COURSE LEARNING OUTCOMES
CELL BIOLOGY AND BIOCHEMISTRY S1 -BTEC -1T <i>Major-I</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand basics of cell biology2. Appreciate the importance of bonding and spatial arrangements of molecules for proper functioning and stability3. Understand both the physical as well as chemical properties of biomolecules4. Learn technique of biochemical testing. The decrease or increase in the amount of some of the biomolecules can have clinical significance5. Go for medical laboratory technique courses opening opportunities in hospitals and pathological laboratories
MICROBIOLOGY AND IMMUNOLOGY S1 -BTEC -2T <i>Major-II / Minor / Open Elective</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand microbial diversity and nutrition2. Understand immune system3. Describe role of immune system in both maintaining health and contributing to disease4. Understand immunoglobulin structure, types and functions and can apply the concept of hypersensitivity and vaccination for different diseases
LAB WORK FOR CELL BIOLOGY AND BIOCHEMISTRY (PRACTICAL) S1 -BTEC -1P <i>Major-I</i>	<i>At the end of the lab work, a student will be able to-</i> <ol style="list-style-type: none">1. Understand basic techniques of cell biology2. Know the physical as well as chemical properties of biomolecules3. Understand that how increase and decrease in amount of biomolecules affects clinical activities
LAB ON MICROBIOLOGY AND IMMUNOLOGY (PRACTICAL) S1 -BTEC -2P <i>Major-II / Minor / Open Elective (Practical)</i>	<i>On completion of this lab work, learners will be able to-</i> <ol style="list-style-type: none">1. Understand about sterilization methods2. Understand working and working principle of instruments - Laminar airflow, Autoclave, Hot air oven etc.3. Learn practically, clinical methods of immunology

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II Year / Diploma Course

COURSE TITLE	COURSE LEARNING OUTCOMES
BASIC MOLECULAR BIOLOGY S2 -BTEC -1T <i>Major-I</i>	After completing, Students will be able to- <ol style="list-style-type: none">1. Explain role of different proteins, enzymes involved in cell signalling2. Understand mechanism of genetic damage caused by mutation and role of various repair mechanisms in removing the effect of these mutations3. Explain mechanism of DNA replication, transcription, translation and other related processes
RECOMBINANT DNA TECHNOLOGY S2 -BTEC -2T <i>Major-II / Minor / Open Elective</i>	After completing, Students will be able to- <ol style="list-style-type: none">1. Understand various approaches to genetic engineering and their applications in biological research as well as in industries2. Understand principles of molecular biology and technique of Recombinant DNA technology3. Understand function of endonuclease enzymes4. Understand the application of Recombinant DNA technology in medicine, industry, agriculture, health5. Understand about DNA Fingerprinting
LAB WORK FOR BASIC MOLECULAR BIOLOGY (PRACTICAL) S2 -BTEC -1P <i>Major-I (Practical)</i>	At the end of the lab work, a student will be able to- <ol style="list-style-type: none">1. Explain role of different proteins and enzymes involved in cell signalling2. Done isolation and visualisation of DNA3. Create plasmid restriction map4. Quantify DNA using UV/VIS spectrophotometer
LAB WORK FOR RECOMBINANT DNA TECHNOLOGY (PRACTICAL) S2 -BTEC -2P <i>Major-II / Minor / Open Elective (Practical)</i>	At the end of the lab work, a student will be able to- <ol style="list-style-type: none">1. Isolate DNA from bacterial/plant/animal cells2. Demonstrate Polymerase Chain Reaction3. Demonstrate southern blotting4. Demonstrate Bacterial Conjugation, Transduction and Transformation

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III Year

COURSE TITLE	COURSE LEARNING OUTCOMES
MOLECULAR BIOLOGY AND GENETIC ENGINEERING BSC1Y306 <i>Paper-I</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand the molecular aspects of the biology2. Predict the structural and functional details of various cell organelles and their properties3. Differentiate the structure, function and numerical alterations of chromosomes in prokaryotes and eukaryotes4. Examine in details the factors affecting the regulation of RNA and protein synthesis and their properties5. Understand the basic steps of gene cloning and the role of enzymes and vectors responsible for gene manipulation, transformation and genetic engineering6. Acquire theoretical knowledge in the techniques, tools, applications and safety measures of genetic engineering7. Describe the genome mapping, sequencing and methods for gene therapy
APPLIED BIOTECHNOLOGY BSC1Y307 <i>Paper-II</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Highlight the role and characteristics of microorganisms in field of Biotechnology2. Study in detail the growth, genetic organisation of microorganisms and impact of environment on their growth3. Distinguish between different groups of microorganisms, i.e. prokaryotes (Bacteria, Archaea), eukaryotes (Microalgae, Protozoa, Fungi) and Viruses4. Explain nutritional types of microorganisms, their growth and parameters that affect it5. The principles, practices, preparation and applications of plant tissue culture media6. Identify the cellular and molecular basis of immune responsiveness.7. Explain the concepts of innate and adaptive immune response and techniques for clinical diagnosis.8. Illustrate the methodology to establish animal cell culture.9. Describe the importance of engineering animal cells for the production of therapeutic proteins

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COURSE TITLE	COURSE LEARNING OUTCOMES
LAB WORK (PRACTICAL) BSC1Y306(P) (Practical)	<i>At the end of the lab work, a student will be able to-</i> <ol style="list-style-type: none">1. Design an experiment to produce recombinant proteins, vaccines and pharmaceutical compounds2. Prepare M.S.- media and its uses in plant tissue culture technique3. Learn the basic principle of Gradient Plate Technique4. Study types of blood cells and blood groups5. Demonstrate basic fermenter design and PCR6. Differentiate various types of cloning and expression vectors

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Master of Science in Biotechnology

Program Specific Outcomes

After successful completion of the M.Sc. Biotechnology program, the students will be able to:

1. Demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology
2. Demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation
3. Gain fundamental knowledge in animal and plant Biotechnology and their applications
4. Describe fundamental molecular principles of genetics
5. Describe the basics of genetic mapping
6. Understand how gene expression is regulated
7. Familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry
8. Understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases
9. Gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research

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I Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
CELL BIOLOGY MSC024	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know about the cell and its biology; understand the origins of cells, cell diversity and features of cellular structure and function2. Understand the structure of prokaryotic and eukaryotic cells, macromolecules, membranes and cell organelles3. Understand the processes of cell such as absorption and pathway of electrical signals and secretion
BIOMOLECULES AND METABOLISM MSC025	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know structures and functions of major bio-molecules2. Understand metabolic pathways, their diversity and how these are specifically regulated and interrelated in different cells3. Conceptualize enzyme kinetics, regulation and specificity
MICROBIOLOGY MSC026	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand the diversified branches of microbiology2. Know the theoretical and practical aspects of microbial growth and physiology3. Learn about the morphology and physiological characteristics of different groups of microorganisms4. Understand virus cultivation, phages and bacterial/yeast genetics
BIO-INSTRUMENTATION MSC027	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand physics in biosensor electrode2. Understand principle, design and applications of biomedical instrumentations3. Understand the techniques, skills and modern engineering tools necessary for engineering practice4. Analyse contemporary bioinstrumentation studies to make connections and decisions based on their scientific merit

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COURSE TITLE	COURSE LEARNING OUTCOMES
LAB COURSE - I (PRACTICAL) MSC029	<i>At the end of the lab work, a student will be able to:</i> <ol style="list-style-type: none">1. Understand the basic components of prokaryotic and eukaryotic cells2. Compare and contrast meiosis and mitosis and why these similarities and differences are important to sexually reproducing species of organisms3. Prepare slides of chromosome; Meiosis - rat/mouse testis, grasshopper testis4. Do polytene chromosome preparation from <i>Drosophila</i> salivary gland5. Do titration of amino acids6. Determine pk from colorimeter7. Analyse oils- iodine number, saponification value, acid number
LAB COURSE - II (PRACTICAL) MSC030	<i>At the end of the lab work, a student will be able to:</i> <ol style="list-style-type: none">1. Prepare liquid and solid media for growth of microorganisms2. Isolate and maintain organisms by plating, streaking and serial dilution method, slant and stab cultures, storage of microorganisms3. Prepare pure cultures from soil and water4. Examine bacteria by Gram Stain technique5. Testify mutation by Ame's Test6. Separate Amino acid, carbohydrate by Paper and Thin Layer Chromatography7. Perform exchange and Gel Filtration Chromatography8. Separate blood cells by Density Gradient Centrifugation

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II Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
MOLECULAR BIOLOGY MSC2019	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn DNA replication, recombination and repair, transcription and translation2. Aware of the modern tools and techniques of genomics and isolation and identification of genes3. Understand the biology and application of antisense technologies and biology of cancer
IMMUNOTECHNOLOGY MSC2020	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand the basic concept of innate and acquired immunity2. Gain knowledge about immunoglobulin structures and diversity of antibodies, morphology and functions of various immune cells3. Understand the basic mechanisms of hypersensitivity responses and their associations with different diseases4. Provide basic understanding of immunology and immune responses in response to various infectious and non-infectious diseases
ENZYME TECHNOLOGY MSC2021	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Describe structure of carbohydrates2. Describe the biosynthesis and enzymatic degradation of biomass carbohydrates3. Describe lignin structure, biosynthesis, and enzymatic degradation4. Summarize current processes involved in industrial enzyme production, from protein production to purification and formulation5. Describe methods for selection and optimisation of industrial enzymes using genetic and biochemical techniques6. Describe the principles and methods of metabolic engineering of (micro) organisms to produce industrial chemicals

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COURSE TITLE	COURSE LEARNING OUTCOMES
<p>ENVIRONMENTAL BIOTECHNOLOGY & ANIMAL BIOTECHNOLOGY</p> <p>MSC03208</p>	<p><i>After successful completion of this course, students will be able to-</i></p> <ol style="list-style-type: none"> 1. Evaluate the potential of biodegradation of organic pollutants, taking microbial and physical/chemical environments, as well as the chemical structure of the compound itself, into consideration 2. Understand the phenomenon of phytoremediation 3. Learn environmental quality evaluation, monitoring, and remediation of contaminated environments 4. Learn use of biosensors in environmental analysis, environmental engineering 5. Understand structure of genes and genomes 6. Understand how genes are expressed and regulatory mechanisms to control gene expression 7. Understand basic principles and techniques in genetic manipulation and genetic engineering 8. Understand techniques and problems both technical and ethical in animal cloning
<p>LAB COURSE - III (PRACTICAL)</p> <p>MSC2024</p>	<p><i>At the end of the lab work, a student will be able to:</i></p> <ol style="list-style-type: none"> 1. Isolate genomic DNA and Restriction Digestion 2. Perform size fractionation of restricted DNA fragments by Agarose Gel Electrophoresis 3. Determine Amax of purified DNA fragments 4. Isolate RNA 5. Prepare blood film and identify cells 6. Understand technique of immunization and production of polyclonal antibodies 7. Purify IgG from serum 8. Prepare O antibody - enzyme conjugates
<p>LAB COURSE - IV (PRACTICAL)</p> <p>MSC2025</p>	<p><i>At the end of the lab work, a student will be able to:</i></p> <ol style="list-style-type: none"> 1. Determine optimum time, temperature and pH 2. Determine Km value 3. Estimate urease by Titrimetric Method 4. Purify enzyme 5. Determine Dissolved Oxygen (DO) concentration of water sample 6. Determine Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of sewage sample 7. Isolate xenobiotic degrading bacteria by selective enrichment technique 8. Prepare tissue culture medium and membrane filtration

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III Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
GENETIC ENGINEERING MSCC042301	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Familiarise with the tools and techniques of genetic engineering2. Understand the applications of genetic engineering in biological research3. Acquire knowledge of advances in biotechnology- healthcare, agriculture and environment cleanup via recombinant DNA technology
PLANT BIO-TECHNOLOGY MSCC042302	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn the principals and technical advances behind the <i>in vitro</i> culture of plant cells and rDNA techniques2. Learn the applications of plant transformation to improve the productivity and performance of plants under biotic and abiotic stresses3. Understand the use of antisense technologies for improvement of crop plants
BIOPROCESS ENGINEERING AND MICROBIAL TECHNOLOGY MSCC042303	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Gain knowledge of application and functioning of bioreactors2. Understand the downstream procedure and fermenter waste treatment3. Gain basic information of microbial cultures, sterilisation methods and enzyme production4. Learn about the bio-safety guidelines5. Understand the mechanism of drug resistance
BIOSTATISTICS, COMPUTERS AND COMMUNICATION SKILLS MSCC042304	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand and apply statistical methods for design and analysis of biomedical research data2. Learn the use of mathematical and statistical theory, and applications of biostatistical methods3. Learn to set study design, data coordination, management, statistical analysis and reporting of study results4. Develop and evaluate new and existing statistical methodology5. Understand the basic terminology used in computer programming6. Understand concept of file, folder, directories and their managements7. Understand basic concept of windows and LINUS operating system

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COURSE TITLE	COURSE LEARNING OUTCOMES
LAB COURSE - I (PRACTICAL) MSCC042305	At the end of the lab work, a student will be able to: <ol style="list-style-type: none">1. Isolate Plasmid DNA and Phage DNA2. Quantify nucleic acid3. Draw Restriction Map of plasmid DNA4. Prepare helper phage and its titration5. Perform Polymerase Chain Reaction6. Perform restriction digestion of plant genomic DNA
LAB COURSE - II (PRACTICAL) MSCC042306	At the end of the lab work, a student will be able to: <ol style="list-style-type: none">1. Isolate industrially important microbes from the environment2. Determine of TDP and TDT of microorganisms for a design of a steriliser3. Determine growth curve of an industrial organism and compute substrate, degradation profile, specific growth rate and growth yield4. Program concepts and tools5. Understand basics of programming languages and operations related to LINUX6. Understand concepts of file, folder directories etc.



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IV Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
EMERGING TRENDS IN BIOTECHNOLOGY MSCC042401	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Comprehensive and detailed understanding of genetic methodology2. Understand how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability etc.3. Understand role of genetic mechanisms in evolution4. Explain the interaction between biomolecules and nanoparticle surface and its applications5. Optimize the synthesis of Biocompatibility of Nanomaterials6. Analyse different types of DNA based Nanostructures7. Identify the risk assessments involved bio nano materials
BIOINFORMATICS AND ENTREPRENEURSHIP IN BIOTECHNOLOGY AND IPR MSCC042402	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand and describe and use the biological databases, perform structured query and analyse and discuss the results in biologically significant way2. Acquire knowledge of computer languages- PERL, C, SQL and JAVA and to write programs to solve biological problems3. Explain principle, algorithm and different methods of sequence alignments as well as execute alignments to address research problems4. Become familiar with a wide variety of bioinformatics tools and software and apply these to conduct basic bioinformatics research and thus develop platform for molecular biology experiments
LAB COURSE (PRACTICAL) MSCC042403	<i>At the end of the lab work, a student will be able to understand-</i> <ol style="list-style-type: none">1. Applications of stem cell2. Western Blot diagnostics3. Concept, principle and types of Biosensors4. Principle, methods and applications of In vitro fertilization5. Biochemical markers of disease diagnosis

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COURSE TITLE	COURSE LEARNING OUTCOMES
PROJECT MSCC042404	<p><i>The purpose of this course is to help students organise ideas, material, and objectives for their dissertation and to begin development of communication skills and to prepare the students to present their research and explain its importance to their fellow classmates and teachers. Students should be able to demonstrate the following abilities-</i></p> <ol style="list-style-type: none">1. Formulate a scientific question2. Present scientific approach to solve the problem3. Interpret, discuss and communicate scientific results in written form4. Gain experience in writing a scientific proposal5. Learn how to present and explain their research findings to the audience effectively

(Shri Vikas Pitre)

HOD

Department of Biotechnology

(Dr. Niranjan Shrotriya)

CO-ORDINATOR, IQAC

Govt. Postgraduate College,

Guna (M.P.)

(Dr. B.K. Tiwari)

PRINCIPAL

Govt. Postgraduate College,

Guna (M.P.)



Govt PG College, Guna (MP)