

**PROGRAMME OUTCOMES, PROGRAMME SPECIFIC OUTCOMES,
COURSE OBJECTIVES AND COURSE OUTCOMES OF THE SYLLABUS
FOR B.SC. HONOURS IN MICROBIOLOGY**

CHOICE BASED CREDIT SYSTEM



**DEPARTMENT OF MICROBIOLOGY
RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE,
RAHARA**

2018

Programme Name: BSc with Honors in Microbiology

Programme Code: UGMCB

Programme Outcome:

After completion of the B.Sc degree program, the students will be able to

PO No.	Program Outcomes	Cognitive Level
PO 1	Recognize the scientific tempers and attitudes, which in turn can prove to be beneficial for the society since the scientific developments can make a nation or society to grow at a rapid pace.	R
PO 2	Understand scientific knowledge and exchange ideas with other stakeholders; make people aware about sustainable utilization of resources with ethical approach.	U
PO 3	Understand and apply the issues of environmental contexts and sustainable development as a basic interdisciplinary concern.	U, Ap
PO 4	Create the ability to perform experiments and to analyse & interpret the obtained accurate results and thus gain the ability to solve problems, to involve in critical, independent, and creative thinking.	An, E, C
PO 5	Possess expertise to apply and formulate ideas which will provide them competitive advantage in pursuing higher studies from India or abroad; and seek jobs in academia, research or industries.	Ap, E
PO 6	Assemble the acquired in-depth knowledge of applied subjects towards the inculcation of professional and employment skills so that students can make a career and become an entrepreneur in diverse fields.	C

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating



Programme Specific Outcome for B.Sc (Hons) in Microbiology:

After completion of the B.Sc (Hons) in Microbiology, the students will be able to

PSO No.	Program Specific Outcomes	Cognitive Level
PSO 1	Explain the concept of Microbiology starting from history, basic laboratory techniques, safety measures and relate fundamental knowledge about the diverse groups of microorganisms.	R, U
PSO 2	Compare several allied subject areas including biochemistry, cell biology, immunology, virology, molecular biology, recombinant DNA technology and apply the knowledge in research and industrial processes.	Ap
PSO 3	Take part in proper collection, forwarding of microbiological and parasitological specimens to the laboratory, examine various parameters and interpret maintaining the ethical guidelines.	An, E
PSO 4	Interpret the integral role of microorganisms associated with specific disease, vital role of microorganisms in agriculture, environmental remediation, biotechnology, fermentation, medicine, food, dairy, pharmaceutical and other industries important to human well-being.	U
PSO 5	Design basic experiment plan on Microbiology and related fields, estimate the required parameters using modern techniques and instruments, solve problems to improve current understanding or develop alternative solutions to current problems.	C

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CC-1: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY**SEMESTER –I****Course code: UGMCBCC01****Course objectives:** Students should

- Learn about history and development of Microbiology.
- Understand diverse microbial groups and their basic features
- Handle the basic instruments and microbial specimen

Course Outcomes:

At the end of this course, students should be able to:

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Explain historical development of Microbiology	U	PO 2, PSO 1
CO-2	Analyze the differences and relationships between diverse microbial groups	An	PO 4
CO-3	Use the basic instruments in Microbiology Lab	Ap	PO 5, PO 6, PSO 1
CO-4	Identify certain microscopic specimen	R	PO 6, PSO 3
CO-5	Design basic experiment for assessing asepticity	C	PO 1, PO 4, PSO 5

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CC-2: BACTERIOLOGY**SEMESTER –I****Course code: UGMCBCC02****Course objective:** Students should

- Understand bacterial morphology, growth, reproduction.
- Culture, visualize and monitor bacterial cells in Microbiology lab.

Course Outcomes: At the end of this course, students should be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Recognize, identify and differentiate the internal and external structures of procaryotic cells.	R, U	PO 1, PO 4, PSO 1
CO-2	Describe the basic principles, components and optics of different microscopic techniques.	U	PO 5, PSO 1, PSO 2
CO-3	Explain the basic stages of microbial growth, reproduction and apply different methods to control them.	U, Ap	PSO 2, PSO 4
CO-4	Estimate microbial growth under lab conditions.	An	PO4, PSO 1
CO-5	Demosntrate culturing and staining bacteria from different sources and characterization.	Ap	PO 4, PSO 1, PSO 3



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CC-3: BIOCHEMISTRY (THEORY)**SEMESTER –II****Course code: UGMCBCC03****Course objective:** Students should

- Understand the concept of pH, buffer and biomolecules.
- Learn the assay procedures of different biomolecules.

Course Outcomes:

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Define buffer and its role to bioactive molecules	R	PSO 1, PSO 2
CO-2	Describe the salient characteristics of biomolecules	U	PSO 2
CO-3	Compare the level of structure of biomolecules	A	PO 1, PSO 2
CO-4	Demonstrate qualitative and quantitative estimation	Ap	PO2, PO4, PSO 2
CO-5	Construct models to study protein structures	C	PO 5, PO 6, PSO 5

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CC-4: VIROLOGY (THEORY)**SEMESTER –II****Course code: UGMCBCC04****Course objectives:** Students should

- Learn about virus, subviral particles and their classification
- Understand their role in disease transmission
- Learn the methods used for laboratory culture and manipulation of viruses.

Course Outcomes: At the end of this course, students will be able to:

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	List general properties of viruses and categorize different viral groups	R	PSO 1
CO-2	Explain salient features of viral nucleic acid and its replication strategies.	U	PSO 2
CO-3	Interpret general principles of viral disease transmission, control and vaccination.	E	PO 1, PSO 4
CO-4	Explain oncogenic nature of certain viruses.	U	PO 2, PSO 4
CO-5	Compare and contrast methods used for laboratory manipulation of viruses.	An	PO 4, PO 5, PSO 3

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B.Sc. Honours in Microbiology
CC-5: MICROBIAL PHYSIOLOGY AND METABOLISM

SEMESTER –III

Course code: UGMCBCC05

Course objectives: Students should

- Understand microbial metabolism and growth
- Study progress of metabolic procedures
- Learn the diversity and utility of microbial metabolism

Course Outcomes:

After completion of this course, the students will be able to:

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Define the patterns of microbial growth	R	PSO 2
CO-2	Describe the effect of environment on microbial growth	U	PO 3, PSO 2
CO-3	Explain the nutrient uptake mechanisms of microbes	U	PO 4
CO-4	Classify the microbes based on their mode of metabolisms	An	PSO 2
CO-5	Assess the metabolism procedures of microbes	E	PO 5, PSO 3, PSO 5.

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CC-6: CELL BIOLOGY

SEMESTER –III

Course code: UGMCBCC06

Course Objectives: Students should

- Understand eukaryotic cellular structure and its difference from prokaryotes.
- Correlate the cell molecular pathway with cell cycle and cell death
- Learn the different stages of cell division

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Illustrate the basic cellular structure	Ap	PSO 2
CO-2	Relate Central Dogmatic pathway with organelles	U	PO 1, PSO 2
CO-3	Compile the possible outcomes of cellular signalling	C	PO 2, PO 4
CO-4	Correlate the cell molecular pathway with cell cycle and cell death	An	PO 1, PSO 2, PSO 4
CO-5	Assess the different stages of cell division	E	PO 4, PSO 5



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CC-7: MOLECULAR BIOLOGY

SEMESTER -III

Course code: UGMCBCC07

Course Objectives: Students should

- Understand structure and types of nucleic acids.
- Learn the isolation of genomic DNA and assess the content.
- Understand the central dogma and the regulatory aspects.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Discuss the structures of nucleic acid	U	PSO 2
CO-2	Demonstrate the isolation of genomic DNA	Ap	PO 4, PO 5
CO-3	Analyze transcription and post transcriptional event	An	PO 4, PSO 3
CO-4	Assess the content of DNA and RNA	E	PO 6, PSO 5
CO-5	Construct various models of DNA replication	C	PO 5, PSO 5

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CC-8: MICROBIAL GENETICS

SEMESTER -IV

Course code: UGMCBCC08

Course Objectives: Students should

- Understand bacterial and viral genetic system.
- Analyze the different mechanisms of genetic exchange, mutation and roles in gene evolution.
- Handle the instruments and demonstrate experiments on microbial genes.

Course Outcomes:

After completion of this course, the students will be able to:

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Define mutation and its effect on microbial genome	R	PO 2, PSO 4
CO-2	Categorize and compare different mechanisms of genetic exchange	An	PSO 2, PSO 4
CO-3	Demonstrate the use of transposons in gene evolution	Ap	PO 3
CO-4	Explain the features of bacteriophage genetic system	U	PSO 2
CO-5	Define plasmids and deduce their different conformation	R, E	PO 4, PO 5



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CC-9: ENVIRONMENTAL MICROBIOLOGY

SEMESTER –IV

Course code: UGMCBCC09

Course Objectives: Students should

- Understand microbial habitat, different components and interaction of living organisms.
- Learn to apply the concept for sustainable rural & urban development.
- Assimilate the concept of waste management and the basis of environmental monitoring.

Course Outcomes:

After completion of this course, the students will be able to:

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Identify various microbial habitat	R	PO 2, PO 3
CO-2	Compare different microbial interactions	U	PO 2, PO 3
CO-3	Demonstrate the function of microbes on environment	Ap	PO 1, PSO 4
CO-4	Assess the efficacy of waste management	An	PO 2, PO 3, PO 4, PO 5, PSO 5
CO-5	Develop programming for sustainable rural & urban development	C	PO 6, PSO 5

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CC-10: FOOD AND DAIRY MICROBIOLOGY

SEMESTER –IV

Course code: UGMCBCC10

Course Objectives: Students should

- Understand the conditions and mechanism of food spoilage and food intoxication by microorganisms.
- Learn the methods of food preservation.
- Conceptualize the methods of food fermentation and preparation of fermented food.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Identify the different factors that affect the microbial growth in foods.	R	PO 1, PSO 1
CO-2	Explain the mechanisms of various food spoilage by microorganisms	U	PO 2, PSO 1
CO-3	Illustrate the methods of food preservation	Ap	PO 3, PO 5, PSO 4



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CO-4	Inspect the food intoxications and food infections and their preventive measure	An	PO 4, PO 5, PSO 3, PSO 4
CO-5	Assess the level of food sanitation, control measures and detection of foodborne pathogens	E	PO 6, PSO 5

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CC-11: INDUSTRIAL MICROBIOLOGY

SEMESTER –V

Course code: UGMCBCC11

Course Objectives: Students should

- Learn the history and development of industrial microbiology.
- Understand the fermentation parameters and choose the best fermentation processes, bio-reactors etc.
- Conceptualize the upstream and downstream processing

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Summarize the history of industrial microbiology	U	PO 1, PSO 1
CO-2	Isolate industrially important microbial strains and design the fermentation media	C	PO 4, PO 5, PO 6, PSO 5
CO-3	Assess the fermentation parameters and choose the best fermentation processes, bio-reactors etc	E	PO 4, PO 5, PO 6, PSO 2, PSO 4
CO-4	Compare different down-stream processing steps	An	PO 3, PO 6, PSO 5
CO-5	Demonstrate enzyme immobilization methods and microbial production of certain industrial products	Ap	PO 3, PO 4, PSO 2, PSO 5

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CC-12: IMMUNOLOGY

SEMESTER –V

Course code: UGMCBCC12

Course Objectives: Students should

- Learn the functions of different immune cells in generation of immune response.
- Understand the characteristics of antigen, antibody and their interaction.
- Conceptualize about different immunological disorders and their consequences.



Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Recognize important contributions of several scientists in immunology	R	PO 1, PSO 1
CO-2	Describe the functions of different immune cells in generation of immune response	U	PSO 2
CO-3	Illustrate the characteristics of antigen, antibody and their interaction	Ap	PO 2, PSO 2
CO-4	Compile different immunological disorders and their consequences	C	PO 2, PSO 3
CO-5	Analyze the principle of some important immunological techniques on experimental basis	An	PO 4, PO 5, PO 6, PSO 5

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CC-13: MEDICAL MICROBIOLOGY**SEMESTER –VI**

Course code: UGMCBCC13

Course Objectives: Students should

- Learn the importance of normal microflora of human body.
- Understand pathogenicity of causative agents for various infectious diseases and management.
- Assimilate the activities of antimicrobial agents and resistant mechanisms.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	List the normal microflora of human body	R	PO 2, PSO 1
CO-2	Explain sample collection and diagnosis processes of microbial diseases	U	PO 3, PSO 3
CO-3	Compare various bacterial, viral, fungal, protozoan diseases	An	PO1, PO 2, PSO 4
CO-4	Perform antibacterial sensitivity tests	Ap	PO 4, PO 5, PO 6, PSO 3, PSO 5
CO-5	Assess different antimicrobial agents based on their modes of action and developing resistance	E	PO 3, PO 5, PSO 3, PSO 5

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B.Sc. Honours in Microbiology
CC-14: RECOMBINANT DNA TECHNOLOGY

SEMESTER –VI

Course code: UGMCBCC14

Course Objectives: Students should

- Learn the concept of cloning and genetic engineering.
- Prepare recombinant DNA, develop the concept of DNA amplification and library construction.
- Understand the scope and application of the techniques in human welfare.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	List the main breakthroughs in the field of genetic engineering	R	PO 1, PSO 1
CO-2	Evaluate the different strategies and methods in molecular cloning	E	PO 5, PO 6, PSO 2
CO-3	Illustrate the idea about Genomic and cDNA libraries and apply the technologies in human welfare	U, Ap	PO 2, PO 4, PSO 2
CO-4	Analyze the outcome of DNA amplification and sequencing experiments	An	PO 4, PO 5, PSO 3, PSO 5
CO-5	Validate the basic methods of cloning and formulate standardized protocol to prepare recombinant DNA	E, C	PO 6, PSO 4, PSO 5

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DSE-1: INHERITANCE BIOLOGY

Course Code: UGMCBDSE01

Course Objectives: Students should Learn about Principles of inheritance

- Understand the scope of quantitative genetics and its application
- Be able to solve the problems related to heredity.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	List the basic principles of Mendelian inheritance at the molecular and cellular levels.	R	PO 1, PSO 2
CO-2	Explain the inheritance of linked genes, its physical basis and construct genetic map from the recombination data.	U, C	PO 2, PO 5
CO-3	Illustrate chromosomal structure and extra-chromosomal inheritance	U	PO 5
CO-4	Determine relationship between organism-level patterns of heredity ("classical" genetics) and molecule level phenomena ("modern" genetics)	An	PO 2, PO 4



CO-5	Apply the principles of inheritance to solve problems regarding human heredity	Ap	PO 2, PO 6, PSO 5
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DSE-2: MICROBIAL BIOTECHNOLOGY

Course Code: UGM CBDSE02

Course Objectives: Students should

- Learn about various scopes of microbial biotechnology.
- Handle different techniques of biotechnology and apply them for mankind.
- Understand the ethical guidelines and intellectual property rights.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Define the microbial biotechnology and list its scope	R	PO 1, PO 2, PSO 2
CO-2	Utilize the microbial biotransformation procedures and apply the microbial product recovery process	Ap	PO 3, PO5, PO 6, PSO 4
CO-3	Assess the role of microbes in bioremediation and bio-energy production	Ev	PO 2, PO 3, PO 4, PSO 4
CO-4	Analyze and categorize the various application of RNAi	An	PO 4, PO 5, PSO 5
CO-5	Apply the intellectual property rights in scientific works and communication.	Ap	PO 5, PSO 3

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DSE-3: PROJECT WORK

Course Code: UGM CBDSE03

Course Objectives: Students should

- Learn to address scientific problems and look for solution.
- Critically analyze obtained data and express with proper scientific terminology.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Undertake problem identification, formulation and solution through sustained critical investigation	U	PO 1, PO 2, PSO 5
CO-2	Explain and relate the basics of the study with recent research and available literature	Ap	PO 2, PO 4
CO-3	Analyze and summarize the important features of the study.	An	PO 4, PO 5
CO-4	Develop strong writing skills & ability to deliver a presentation on the topic of his subject	C	PO 5, PO 6



CO-5	Evaluate critical thinking & communication skills needed in professional spheres.	E	PO 6, PSO 5
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DSE-4: INSTRUMENTATION AND BIOTECHNIQUES

Course Code: UGMCBDSE04

Course Objectives: Students should

- Understand the principles and application of various instruments
- Handle the instruments with proper care and follow the precautions.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Explain basic principle of preparative and analytical centrifugation	R, U	PO 1, PO 2, PSO 2
CO-2	Apply polyacrylamide gel electrophoresis	Ap	PSO 2
CO-3	Compare different chromatographic techniques	An	PO 5, PSO 2
CO-4	Assemble column packing in column chromatography	C	PO 5, PO 6, PSO 5
CO-5	Illustrate ray diagrams of different types of microscopy and assess their magnification	Ap, E	PO 5, PSO 5

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DSE-5: ADVANCES IN MICROBIOLOGY

Course Code: UGMCBDSE05

Course Objectives: Students should

- Understand metagenomic approach to address non culturable microbes.
- Case study to understand synthetic biology and networking of biological systems

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Outline the idea of genome evolution and metagenomics	R	PO 1, PO 2
CO-2	Relate host pathogen relationship, HGT through evolution	U	PO 2, PO 3, PSO 2
CO-3	Estimate metagenomic DNA through practical process	E	PO 4, PO 5, PSO 3
CO-4	Perform PCR amplification of metagenomic DNA and analyze the result using algorithm.	Ap, An	PO 4, PO 5, PO 6
CO-5	Construct network of metabolic pathways for given bacteria based on Systems Biology.	C	PO 5, PO 6, PSO 5

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GE-1: BACTERIOLOGY AND VIROLOGY**Course Code: UGMCBGE01****Course objectives:** Students should

- Understand bacterial and viral morphology, growth, reproduction.
- Culture, visualize and monitor bacterial cells in Microbiology lab.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Recognize, identify and differentiate the internal and external structures of prokaryotic cells and virus.	R, U	PO 1, PO 4, PSO 1
CO-2	Understand the basics of bacterial reproduction and estimate microbial growth under lab conditions.	U, E	PSO 1, PSO 3
CO-3	Determine microbial count using laboratory culture and detect bacteria by simple and differential staining	Ap, E	PO 4, PO 5, PSO 1, PSO 3
CO-4	List general properties and importance of viruses and subviral particles	R	PO 1
CO-5	Develop strategies for isolation and propagation of plant viruses	An, C	PO 2, PO 3, PO 6, PSO 5

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GE-2: MICROBES IN ENVIRONMENT**Course Code: UGMCBGE02****Course Objectives:** Students should

- Understand microbial habitat, different components and interaction of living organisms.
- Learn to apply the concept for sustainable rural & urban development.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Identify various microbial habitat	R	PO 2, PO 3
CO-2	Compare different microbial interactions	U	PO 2, PO 3
CO-3	Demonstrate the function of microbes on environment	Ap	PO 1, PSO 4
CO-4	Assess the efficacy of waste management	An	PO 2, PO 3, PO 4, PO 5, PSO 5



CO-5	Develop programming for sustainable rural & urban development	C	PO 6, PSO 5
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GE-3: INDUSTRIAL AND FOOD MICROBIOLOGY

Course Code: UGMCBGE03

Course Objectives: Students should

- Learn the history and development of Industrial Microbiology.
- Understand the fermentation parameters, upstream processing, fermentation process, bio-reactor, downstream processing.
- Conceptualize the methods of food fermentation, food preservation, food sanitation and brief idea about food borne illness.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Summarize the history and development of Industrial Microbiology	R, U	PO 1, PSO 1
CO-2	Isolate industrially important microbial strains and design the fermentation media	C	PO 4, PO 5, PO 6, PSO 5
CO-3	Compare the industrial fermentation and recovery process of certain microbial products	An	PO 4, PO 5, PO 6, PSO 2, PSO 4
CO-4	Identify different factors that affect the microbial growth, spoilage of food and food borne illness	Ap	PO 1, PSO 1, PSO 4
CO-5	Assess foods based on their fermentation process and preservation processes	E	PO 4, PO 6, PSO 4

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GE-4: GENETIC ENGINEERING AND BIOTECHNOLOGY

Course Code: UGMCBGE04

Course Objectives: Students should

- Learn the concept of vector, cloning, recombinant DNA, DNA amplification and genetic engineering.
- Know the scope and application of the techniques in human welfare.
- Understand the ethical guidelines and intellectual property rights.



Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	List the milestones in genetic engineering and biotechnology	R	PO 1, PSO 1
CO-2	Compare the different strategies and methods in molecular cloning	U	PO 5, PO 6, PSO 2
CO-3	Analyze the outcome of DNA amplification and sequencing experiments	An	PO 4, PO 5, PSO 3, PSO 5
CO-4	Assess the importance of genetic engineering and biotechnology in human welfare	E	PO 2, PO 6, PSO 2, PSO 4
CO-5	Apply the intellectual property rights in scientific works and communication	Ap	PO 5, PSO 3

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GE-5: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Course Code: UGMCBGE05

Course Objectives: Students should

- Understand the structure and types of nucleic acids.
- Know the central dogma and regulatory aspects.
- Analyze the different mechanisms of genetic exchange, mutation and roles in gene evolution.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Discuss the structures of nucleic acid	R, U	PSO 2
CO-2	Analyze the transcription and post transcriptional events	An	PO 4, PSO 3
CO-3	Assess the DNA content, resolution and effect of mutagens	E	PO 4, PO 6, PSO 5
CO-4	Categorize and compare different mechanisms of genetic exchange	An	PSO 2, PSO 4
CO-5	Identify the contribution of transposable elements in evolution	Ap	PO 5, PSO 3

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B.Sc. Honours in Microbiology
SEC-1: VALUE EDUCATION AND INDIAN CULTURE
Course Code: UGMCBSEC01

Course Objectives: Students should

- Attain awareness about daily routine, self-evaluation & Integral Personality Development.
- Understand the educational needs, the power of thoughts and the Science of Peace, the relation between values and enlightened citizenship.
- Attain awareness about the Indian practice and culture; acquire idea about Modern India: her hopes, challenges and Swami Vivekananda.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Define, demonstrate and apply the daily routine, self-evaluation & Integral Personality Development	R, U, Ap	PO 1
CO-2	Demonstrate, and apply the Power of thoughts & the Science of Peace	U, Ap	PO 3, PSO 5
CO-3	Demonstrate the relation between Values and enlightened citizenship	U	PO 3, PSO 3
CO-4	Discuss the awareness about the Indian Practice and Culture	C	PO 4
CO-5	Demonstrate and practice the Four Yogas	U, Ap	PO 6
CO-6	Explain and analyse the idea about Modern India: her hopes, challenges and Swami Vivekananda	U, An	PO 4, 6

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SEC-2: ONLINE COURSE (Spoken Tutorial on CellDesigner)
SEMESTER –IV

Course Code: UGMCBSEC02

TOTAL HOURS: 30

Course Objectives: Students should

CREDITS: 2

- Understand various aspects of CellDesigner program.
- Install and start the CellDesigner program
- Run simulation, view and create new model



Course Outcomes: After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Draw gene-regulatory and biochemical networks by CellDesigner, a structured diagram editor.	Ap	PSO 2
CO-2	Design models of biochemical reaction networks in Computer-readable format.	Ap	PO 5, PSO 2
CO-3	Analyze simulation and other analysis packages.	An	PO 5, PO 6
CO-4	Relate data representation with various pictorial representations.	U	PSO 2
CO-5	Browse and modify existing SBML models with references to existing databases, simulate and view the dynamics through an intuitive graphical interface.	E, C	PO 5, PO 6, PSO 5

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AECC-1: ENGLISH COMMUNICATION

SEMESTER –I

Course code: UGMCBAECC01

Course Objectives: Students should

- Improve skills of Listening, Speaking, Reading and Writing in English
- Respond to diverse audiences of scholars, students, and community members.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Recall English Phonetic Symbols and demonstrate their use with emphasis on various scientific terms.	R, U	PO 2, PSO 1
CO-2	Utilize various processes of communication	Ap	PO 2
CO-3	Compare and analyze dialogue, group discussion, presentation, interview techniques	An	PO 5
CO-4	Judge different techniques of reading and writing skills.	E	PO 5, PO 6
CO-5	Develop the skill to create original write up in the form of report, proposal, paragraph, review etc.	C	PO 4, PO 5, PSO 5

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating



B.Sc. Honours in Microbiology
AECC-2: ENVIRONMENTAL SCIENCE (ENVS)

SEMESTER -II

Course code: UGMCBAECC02

Course Objectives: Students should

- Understand the concept, components and function of natural resources and ecosystems.
- Gain knowledge on cause, effects and control measures of pollution and environmental disaster.
- Understand and apply the knowledge about the social, environmental issues and environmental legislation.

Course Outcomes:

After completion of this course, the students will be able to

CO number	Course outcome (CO)	Cognitive level	PO/PSO addressed
CO-1	Define and demonstrate the concept, components and function of natural resources and ecosystems.	R, U	PO1, PSO 4
CO-2	Define, illustrate and analyse the cause, effects and control measures of various environmental pollutants.	R, U, An	PO 3, PSO 3
CO-3	Demonstrate the basic idea about the disasters and its management.	U	PO 3
CO-4	Illustrate and apply the knowledge about the social, environmental issues and environmental legislation.	U, Ap	PO 4
CO-5	Define, demonstrate and evaluate the impact of human population on the Environment	R, U, E	PO 6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

