



# **UNIVERSITY OF CALCUTTA**

## **Notification No. CSR/06/2026**

It is notified for information of all concerned that in terms of the provisions of Section 54 of the Calcutta University Act, 1979, (as amended), and, in the exercise of his powers under 9(6) of the said Act, the Vice-Chancellor has, by an order dated 24.12.2025, approved the revised Course Structure of 4-Year Honours & Honours with Research and 3-year MDC of Microbiology under CCF, 2022, including Programme and Course Outcome.


The above shall take effect from the Odd semester examinations, 2025 and onwards.

Detail Syllabus is Published under CSR/18/2023, dt. 24.07.2023.

SENATE HOUSE

Kolkata-700073

16.01.2026

  
16/01/2026

Prof.(Dr.) Debasis Das

Registrar

## Semester-wise undergraduate course distribution in Microbiology (as per CSR/52/2025 dated 31/07/2025)

### For 4-year Honours Course

Semester	Course Type	Paper code (Course code)	Credit distribution	Course name	Details in page no.
<b>I</b>	IDC <sup>†</sup>	MCB-IDC	2 TH + 1TU	Introduction and Scope of Microbiology	3-4
	Core	MCB-H-CC-1-1 (CC101)*	3 TH + 1 P	Introduction to Microbiology and Microbial Diversity	5-6
	SEC	MCB-H-SEC-1-1 (SEC101)	3 TH + 1 TU	Food Fermentation Techniques and Packaging	7-8
<b>II</b>	IDC <sup>†</sup>	MCB-IDC	2 TH + 1TU	Introduction and Scope of Microbiology	3-4
	Core	MCB-H-CC-2-2 (CC102)*	3 TH + 1 P	Bacteriology	9-10
	SEC	Offered centrally by the university	4 TH + 0 P	AI for everyone	11-12
<b>III</b>	IDC <sup>†</sup>	MCB-IDC	2 TH + 1TU	Introduction and Scope of Microbiology	3-4
	Core	MCB-H-CC-3-3 (CC201)*‡	3 TH + 1 P	Biomolecules and Bioenergetics	13-14
	Core	MCB-H-CC-4-3 (CC202)	3 TH + 1 P	Microbial Physiology and Metabolism	15-16
	SEC	MCB-H-SEC-3-3 (SEC201)	3 TH + 1 TU	Biofertilizers and Biopesticides	17-18
<b>IV</b>	Core	MCB-H-CC-5-4 (CC203)	3 TH + 1 P	Molecular Biology	19-20
	Core	MCB-H-CC-6-4 (CC204)*‡	3 TH + 1 P	Microbiological Analysis of Air and Water	21
	Core	MCB-H-CC-7-4 (CC205)	3 TH + 1 P	Environmental Microbiology	22-23
	Core	MCB-H-CC-8-4 (CC206)	3 TH + 1 P	Food and Dairy Microbiology	24-25
<b>V</b>	Core	MCB-H-CC-9-5 (CC301)	3 TH + 1 P	Virology	26-27
	Core	MCB-H-CC-10-5 (CC302)	3 TH + 1 P	Microbial Genetics	28-29
	Core	MCB-H-CC-11-5 (CC303)	3 TH + 1 P	Industrial Microbiology	30-31
	Core	MCB-H-CC-12-5 (CC304)	3 TH + 1 P	Recombinant DNA Technology	32-33
<b>VI</b>	Core	MCB-H-CC-13-6 (CC305)	3 TH + 1 P	Microbial Biotechnology and Enzymology	34-35
	Core	MCB-H-CC-14-6 (CC306)	3 TH + 1 P	Bacterial Pathogenesis	36-37
	Core	MCB-H-CC-15-6 (CC307)	3 TH + 1 P	Cell Biology	38-39
	Internship <sup>l</sup>	MCB-INT-TU	0 TH + 3 TU	To be conducted during any of the even semesters	40
<b>VII</b>	Core	MCB-H-CC-16-7 (CC401)	3 TH + 1 TU	Fungal, Protozoal and Viral Pathogenesis	41-42
	Core	MCB-H-CC-17-7 (CC402)	3 TH + 1 P	Immunology	43-44
	Core	MCB-H-CC-18-7 (CC403)	3 TH + 1 P	Genetics and Genomics	45-46
	Core	MCB-H-CC-19-7 (CC404)	3 TH + 1 P	Plant Pathology	47-48
	Core	MCB-H-CC-20-7 (CC405)	3 TH + 1 TU	Ecology and Biodiversity	49-50

<b>VIII</b>	RM-1	Research Methodology 1	3 TH + 1 P	Instrumentation and Biotechniques	51-52
	RM-2	Research Methodology 2	3 TH + 1 TU	Essential Tools in Biological Research	53-54
	DSC	MCB-H-DSC-1-8 (DSC401) [for Non-research students]	3 TH + 1 P	Microbes in Sustainable Agriculture and Development	55-56
	DSC	MCB-H-DSC-2-8 (DSC402) [for Non-research students]	3 TH + 1 P	Advances in Microbiology	57-58
	DSC	MCB-H-DSC-3-8 (DSC403) [for Non-research students]	3 TH + 1 TU	Medical Biotechnology	59-60
	Research	For Honours with Research students	4 RI + 8 D	Research Internship and Dissertation	61

\*Courses available in minor and multidisciplinary combinations also; when chosen as minor, CC201 and CC204 will have to be taken together either in Semester V or VI, †IDC is to be taken in any one of the first three semesters only, †Internship can be conducted during any of the even semester to be eligible for exit after even semesters

### For 3-year Multidisciplinary course

Semester	Course Type	Paper code (Course code)	Credit distribution	Course name	Details in page no.
<b>I</b>	IDC <sup>†</sup>	MCB-MDC-IDC (MCB-IDC)	2 TH + 1TU	Introduction and Scope of Microbiology	3-4
	Core	MCB-MDC-CC-1-1 (CC101)*	3 TH + 1 P	Introduction to Microbiology and Microbial Diversity	5-6
	SEC <sup>#</sup>	MCB-MDC-SEC (SEC101)	4 TH + 0 P	Food Fermentation Techniques and Packaging	7-8
<b>II</b>	IDC <sup>†</sup>	MCB-MDC-IDC (MCB-IDC)	2 TH + 1TU	Introduction and Scope of Microbiology	3-4
	SEC <sup>#</sup>	MCB-MDC-SEC (SEC101)	4 TH + 0 P	Food Fermentation Techniques and Packaging	7-8
	Core	MCB-MDC-CC-2-2 (CC102)*	3 TH + 1 P	Bacteriology	9-10
<b>III</b>	IDC <sup>†</sup>	MCB-MDC-IDC (MCB-IDC)	2 TH + 1TU	Introduction and Scope of Microbiology	3-4
	SEC <sup>#</sup>	MCB-MDC-SEC (SEC101)	4 TH + 0 P	Food Fermentation Techniques and Packaging	7-8
	Core	MCB-MDC-CC-3-3 (CC201)*	3 TH + 1 P	Biomolecules and Bioenergetics	13-14
	Minor	MCB-MDC-MN-1-3 (CC101)	3 TH + 1 P	Introduction to Microbiology and Microbial Diversity	5-6
<b>IV</b>	Core	MCB-MDC-CC-4-4 (CC204)*	3 TH + 1 P	Microbiological Analysis of Air and Water	21
	Core	MCB-MDC-CC-5-4 (MDC-CC205)*	3 TH + 1 P	Microbial Genetics and Molecular Biology	62-63
	Minor	MCB-MDC-MN-2-4 (CC102)	3 TH + 1 P	Bacteriology	9-11
<b>V &amp; VI</b>	Core <sup>‡</sup> (Semester V only)	MCB-MDC-CC-6-5 (MDC-CC301)*	3 TH + 1 P	Genetic Engineering and Biotechnology	64-65
	Core <sup>‡</sup> (Semester V or VI)	MCB-MDC-CC-7-5/6 (MDC-CC302)	3 TH + 1 P	Microbial Metabolism	66-67
	Core <sup>‡</sup> (Semester VI only)	MCB-MDC-CC-8-6 (MDC-CC303)	3 TH + 1 P	Medical Microbiology and Immunology	68-69
	Minor (Semester V only)	MCB-MDC-MN-3-5 (CC201)	3 TH + 1 P	Biomolecules and Bioenergetics	13-14
	Minor (Semester V only)	MCB-MDC-MN-4-5 (CC204)	3 TH + 1 P	Microbiological Analysis of Air and Water	21
	Minor (Semester VI only)	MCB-MDC-MN-5-6 (MDC-CC205)	3 TH + 1 P	Microbial Genetics and Molecular Biology	62-63
	Minor (Semester VI only)	MCB-MDC-MN-6-6 (MDC-CC301)	3 TH + 1 P	Genetic Engineering and Biotechnology	64-65

\*Courses offered in both major and minor combinations, †IDC and #SEC courses are to be taken in any one of the first three semesters only, †Internship to be conducted during the entire duration of any semester (see page 70), \*Students will have to choose one course in semester V and two in semester VI or vice versa, depending on the order of the selected major subject

## **MICROBIOLOGY**

### **PROGRAMME AND COURSE OUTCOME OF MICROBIOLOGY** **MAJOR AND MINOR UNDER CCF**

#### **Programme Outcome:**

- Extensive knowledge of classical Microbiology and contemporary subjects spanning various aspects of basic microbiology such as Bacteriology, Virology, Biochemistry, Microbial Physiology, Immunology, Cell Biology, Molecular Biology, Genetics, Systems Biology, Immunology and Molecular biology. In addition to this the course also covers the applied aspects of Microbiology such as Industrial Microbiology, Food and Dairy Microbiology, Environmental Microbiology and Medical Microbiology.
- The course aims to train the students to learn and appreciate the biological diversity of microbial forms so that they can explore and explain the processes used by microorganisms for their replication, survival, and interaction with their environment, hosts, and host populations. They will become aware of the important role microorganisms play in maintenance of a clean and healthy environment. They will learn the role of microorganisms in plant, animal and human health and disease.
- The course also aims to expose the students to various biotechnological applications of microorganisms, the industrially important substances produced by microorganisms and the unique role of microbes in genetic modification technologies.
- The practical aspects of the programme aim to make the students familiar with scientific methodology and execution of experiments. Students will develop the ability to think critically and to read and analyse scientific literature. Students will acquire and demonstrate proficiency in good laboratory practices in a microbiological laboratory and be able to explain the theoretical basis and practical skills of the tools/technologies commonly used to study this field.

Semester	Course Topic	Course Outcome
I	<b>MCB-IDC: INTRODUCTION AND SCOPE OF MICROBIOLOGY [FOR BOTH HONOURS (MAJOR &amp; MINOR) AND MULTIDISCIPLINARY]</b>	<ul style="list-style-type: none"> <li>To understand the history of development of Microbiology starting from the early years</li> <li>To study the diversity of Microbial World and Systems of classification of microorganisms</li> <li>To understand the role of microbes in human health, environment and industry</li> <li>Study of basic microbial processes like microscopy and sterilization</li> </ul>
	<b>CC101: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY</b>  <b>SEC101: FOOD FERMENTATION TECHNIQUES AND PACKAGING</b>	<ul style="list-style-type: none"> <li>To understand the history of development of Microbiology and study the diversity of Microbial World and Systems of classification of microorganisms</li> <li>To understand bacteriology including morphology, metabolism and nutrition patterns of various bacteria, their systematics and taxonomic positions.</li> <li>Understanding the role of microbes in everyday life</li> <li>Understanding the basics of Fermented foods, Probiotics and their health benefits</li> <li>Studies on controlling microbial quality of foods through recognized coding systems suitable packaging techniques</li> </ul>
II	<b>CC102: BACTERIOLOGY</b>  <b>SEC: AI FOR EVERYONE</b>	<ul style="list-style-type: none"> <li>To study the important archaeal and eubacterial groups in microbial world</li> <li>To understand the basic techniques of detecting microorganisms</li> <li>Study of cellular structures of microbes to understand their important metabolic processes like growth and nutrition</li> <li>To understand the fundamental concepts and subfields of AI.</li> <li>Identification of real-world applications of AI across various industries.</li> <li>Analysis of ethical, social, and economic implications of AI.</li> <li>Understanding the potential of AI to drive innovation and transformation in different domains of life</li> </ul>

<p><b>III</b></p>	<p><b>CC201: BIOMOLECULES AND BIOENERGETICS</b></p> <p><b>CC202: MICROBIAL PHYSIOLOGY AND METABOLISM</b></p> <p><b>CC203: BIOFERTILIZERS AND BIOPESTICIDES</b></p>	<ul style="list-style-type: none"> <li>• To understand the basic concepts of bioenergetics and thermodynamics</li> <li>• To study and understand the macromolecules needed for life processes</li> <li>• To study and understand the different types of macromolecules, their structure, function and role in metabolism in living organisms</li>   <li>• To study the effect of environment on microbial growth and related nutrient uptake and Transport</li> <li>• To study Chemoheterotrophic, Chemolithotrophic and Phototrophic metabolic processes</li> <li>• To study the role of Nitrogen Metabolism in Microbial Physiology</li>   <li>• To understand the concept of biofertilizers and their role in advanced agriculture for environment protection and prevention of health hazards</li> <li>• To study nitrogen fixation and phosphate solubilizing bacteria for application as biofertilizers</li> <li>• Study the sources and uses of Biopesticides</li> </ul>
<p><b>IV</b></p>	<p><b>CC203: MOLECULAR BIOLOGY</b></p> <p><b>CC204: MICROBIOLOGICAL ANALYSIS OF AIR AND WATER</b></p> <p><b>CC205: ENVIRONMENTAL MICROBIOLOGY</b></p>	<ul style="list-style-type: none"> <li>• To Study Structures of DNA and RNA</li> <li>• To study Replication of DNA in Prokaryotes and Eukaryotes</li> <li>• To study Transcription and Post Transcriptional modifications in Prokaryotes and Eukaryotes</li> <li>• To study Transcription of DNA and Regulation of gene Expression in Prokaryotes and Eukaryotes</li>   <li>• To learn about aerobic Microbiology, sample collection, analysis and control measures</li> <li>• To learn Water Microbiology, analysis, treatment and control measures</li>   <li>• To help the students to develop an understanding about microorganisms and their habitats</li> <li>• Learning of Microbial Interactions in the form of Microbe-Plant interaction and Microbe-animal interaction</li> </ul>

	<p><b>CC206: FOOD AND DAIRY MICROBIOLOGY</b></p>	<ul style="list-style-type: none"> <li>• To develop an understanding of Biogeochemical Cycling, Waste Management and Microbial Bioremediation</li> <li>• To develop an understanding of the concepts of food as a substrate for microorganisms and Intrinsic and extrinsic factors that affect growth and survival of microbes in foods</li> <li>• Learning of Microbial spoilage of various foods and different principles and methods of food preservation</li> <li>• To study the Food borne diseases and Food sanitation and control</li> <li>• Understanding Fermented foods, Probiotics and their Health benefits</li> <li>• Knowledge on Cultural and rapid detection methods of food borne pathogens in foods and introduction to predictive microbiology</li> </ul>
<p><b>V</b></p>	<p><b>CC301: VIROLOGY</b></p> <p><b>CC302: MICROBIAL GENETICS</b></p> <p><b>CC303: INDUSTRIAL MICROBIOLOGY</b></p>	<ul style="list-style-type: none"> <li>• To study the Nature and Properties of Viruses and Bacteriophages</li> <li>• To Study Viral Transmission, Salient features of viral nucleic acids and Replication</li> <li>• To understand the role of viruses in cancer and different viral diseases</li> <li>• To study the importance and application of virology</li> <li>• Learning of Mutagenesis and Molecular basis of mutations</li> <li>• To understand the concept of Repair and Recombination of DNA</li> <li>• Learning the Mechanisms of Genetic Exchange Conjugation, Transformation, Transduction</li> <li>• To study the molecular biology of Plasmids</li> <li>• To study Transposable elements and Uses of transposons and transposition</li> <li>• Experimental evidences of nucleic acid as genetic material</li> <li>• To learn the Isolation of industrially important microbial strains and fermentation media</li> </ul>



	<b>MCB-INT-TU: INTERNSHIP</b>	<ul style="list-style-type: none"> <li>To make a student familiar with the concept of literature review which will subsequently help in the process of research and higher studies</li> </ul>
<b>VII</b>	<b>CC401: FUNGAL, PROTOZOAL AND VIRAL PATHOGENESIS</b>  <b>CC402: IMMUNOLOGY</b>  <b>CC403: GENETICS AND GENOMICS</b>  <b>CC404: PLANT PATHOLOGY</b>  <b>CC405: ECOLOGY AND BIODIVERSITY</b>	<ul style="list-style-type: none"> <li>To study the basic concepts of host pathogen interaction and details of viral, protozoan and fungal diseases</li> <li>To study general characteristics and mode of action of antimicrobial agents</li> <li>To understand Concept of Innate and Adaptive immunity and Contributions of scientists to the development of field of immunology</li> <li>To study the Immune Cells and Organs, Antigens and Antibodies and Immunological Disorders and Tumor Immunity</li> <li>Learning of the role of the Major Histocompatibility Complex and Complement System in Immunology</li> <li>Learning of Immunological Techniques for the benefit of mankind</li> <li>To learn about the Mendelian principles, linkage and crossing over</li> <li>To learn the structural organization of Chromosomes, extra chromosomal inheritance and recombination</li> <li>Learning human and quantitative genetics and Genomics</li> <li>To understand the history of plant pathology.</li> <li>Learning about the overall stages of development of a plant disease, its epidemiology, about the host pathogen interaction, mechanism and the control measures</li> <li>To learn about some specific plant diseases giving emphasis on its etiological agent, symptoms, dissemination, life cycle and preventive measures</li> <li>To study the different components of the environment</li> <li>To understand the concepts of the types and structure of Ecosystem</li> <li>Study of aspects of ecology in the form of population and community ecology</li> <li>Study of biodiversity and applied ecology</li> </ul>

<p><b>VIII</b></p>	<p><b>DSC401: MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT</b></p> <p><b>DSC402: ADVANCES IN MICROBIOLOGY</b></p> <p><b>DSC403: MEDICAL BIOTECHNOLOGY</b></p> <p><b>RESEARCH METHODOLOGY I: INSTRUMENTATION AND BIOTECHNIQUES</b></p> <p><b>RESEARCH METHODOLOGY II: ESSENTIAL TOOLS IN BIOLOGICAL RESEARCH</b></p> <p><b>RESEARCH INTERNSHIP WITH DISSERTATION</b></p>	<ul style="list-style-type: none"> <li>• To understand the role of microbes in sustainable agriculture and farming by studying soil microbiology, mineralization of soil and microbial activity of soil</li> <li>• To study and understand the concept of Systematics and taxonomy</li> <li>• Understanding the mechanisms and techniques involved in the sequencing of nucleic acids and proteins</li> <li>• Understanding of evolution of Microbial genomes and application to metagenomics.</li> <li>• To study the basics of vaccination and development of vaccines</li> <li>• Learning of molecular basis of cancer and biochemical tests for detection of cancerous cells.</li> <li>• Gaining knowledge on cell culture techniques, gene therapy and gene editing</li> <li>• To understand different techniques of instrumentation giving emphasis on microscopy, chromatography, electrophoresis, spectrophotometry and centrifugation</li> <li>• To familiarize the students about the essential tools of biological research covering fields of biostatistics, bioinformatics and data representation and formulation</li> <li>• To understand the concept of Biosafety and role of IPR in Microbiology</li> <li>• Opportunity to work in real world laboratory environment with specific project goals</li> <li>• Experience to report research findings with established norms and practices</li> <li>• To develop skills to work in a group and learning to setup experiments and explain scientific results</li> </ul>
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