

Meerut Institute of Engineering and Technology, Meerut

Statements of Course Outcomes (COs) and Mapping with Program Outcomes (POs) and Program S

Tech BT Dept. of Biotechnology : 2025-27

(Batch passed-out in 2025; 2025-27) BKL # K1 – Remember, K2 – Understand, K3 – Apply, K4 – /

Create

S. No.	Sub Code	Sem	COx	Statement of Course Outcomes (COs)	Kx	PO 1
				Statement of Course Outcomes (COs) Upon completion of topic concerned, students will be able to :	Blooms Knowledge Level	Independently carry out research /investigation
1	MMBT 101	—	CO-1	Interpret the principles of microbial fermentation, bioprocess design, and kinetics.	K2	2.0
			CO-2	Apply engineering principles to bioreactor design and scale-up.	K3	3.0
			CO-3	Evaluate bio-separation techniques for recovery and purification.	K3	2.0
			CO-4	Integrate advanced downstream processing unit operations.	K3	2.0
			CO-5	Design bioprocess strategies under GMP and regulatory frameworks.	K3	3.0
			MMBT 101			2.4
2	MMBT102	—	CO-1	Describe the features of biological databases and explain sequence alignment algorithms.	k2	2.0
			CO-2	Apply bioinformatics tools for genome annotation and structural prediction of biomolecules.	K3	3.0
			CO-3	Analyze genomic, transcriptomic, and proteomic data using computational approaches.	K3	3.0
			CO-4	Interpret systems biology models and network-based approaches for complex biological data.	K3	2.0
			CO-5	Design computational workflows for molecular docking and drug discovery applications.	K3	3.0
			MMBT102			2.6
3	MMBT103	—	CO-1	Describe the structure, types, and functions of immune cells and molecules.	K2	2.0
			CO-2	Apply immunological techniques such as ELISA, flow cytometry, and western blotting in diagnostics and research.	K3	3.0
			CO-3	Analyze antigen-antibody interactions using advanced serological and immunoassay methods.	K3	3.0
			CO-4	Interpret results from immunological experiments and evaluate immune responses in clinical settings.	K3	2.0
			CO-5	Design experimental approaches using monoclonal antibodies, cytokine profiling, and immunophenotyping techniques.	K4	3.0
			MMBT103			2.6
			CO-1	Explain biochemical principles governing the structure and function of biomolecules.	K2	2.0

4	MMBT104	—	CO-2	Apply enzyme kinetics and regulation in biochemical pathways.	K3	3.0
			CO-3	Analyze metabolic pathways and their integration in physiological and pathological states.	K4	3.0
			CO-4	Evaluate the biochemical basis of diseases and therapeutic targets.	K4	3.0
			CO-5	Utilize biochemical techniques for research and diagnostic applications.	K3	3.0
			MMBT104			2.8
5	MMRM 101	—	CO-1	Explain the fundamentals of research, its objectives, types, and problem definition.	K2	2.0
			CO-2	Describe research design methodologies, the research process, and literature review techniques.	K3	2.0
			CO-3	Apply appropriate data collection methods, sampling techniques, and ethical considerations in research.	K3	3.0
			CO-4	Analyze and interpret research data using statistical techniques and hypothesis testing.	K4	3.0
			CO-5	Develop research reports, thesis, and scientific papers following proper referencing and ethical guidelines.	K4	3.0
			MMRM 101			2.6
6	MMBT 151	—	CO-1	Perform microbial culture techniques and optimize growth conditions.	K3	3.0
			CO-2	Operate laboratory-scale fermenters for biomass and product formation.	K3	3.0
			CO-3	Apply separation techniques like centrifugation, precipitation, and filtration.	K3	3.0
			CO-4	Execute chromatographic methods for biomolecule purification.	K3	3.0
			CO-5	Analyze the yield and purity of fermentation products using standard assays.	K3	3.0
			MMBT 151			3.0
7	MMBT152	—	CO-1	Execute sequence retrieval and data mining using public databases.	K3	3.0
			CO-2	Perform sequence alignment and phylogenetic tree construction.	K3	3.0
			CO-3	Analyze protein structures using computational tools.	K4	3.0
			CO-4	Predict gene functions using genome annotation tools.	K4	3.0
			CO-5	Utilize molecular docking and modeling tools for protein-ligand interactions.	K4	3.0
			MMBT152			3.0
8	MMAE 101	—	CO-1	Understand the concept of sentence formation and usefulness of enriched vocabulary.	K2	1.0
			CO-2	Enhance the listening and comprehending skills.	K3	1.0
			CO-3	Apply the reading and writing skills to prepare clear and well-structured official and business documents.	K3	2.0
			CO-4	Build the skills necessary to deliver impactful presentations.	K3	1.0
			CO-5	Build necessary work-place skills to be a successful professional.	K3	2.0
			MMAE 101			1.4

9	MMBT 201	=	CO-1	Explain the principles and steps involved in bio-separation processes.	K2	2.0
			CO-2	Apply unit operations for concentration and purification of biomolecules.	K3	3.0
			CO-3	Analyze chromatographic and membrane-based separation techniques.	K4	3.0
			CO-4	Analyze different downstream process designs to determine their efficiency and suitability for the recovery and purification of various bioproducts.	K4	3.0
			CO-5	Analyze the critical parameters involved in large-scale bio-product recovery to develop improved and integrated downstream protocols.	K4	3.0
			MMBT 201			2.8
10	MMBT 202	=	CO-1	Explain the principles of recombinant DNA technology, including the basic concepts and tools used.	K2	2.0
			CO-2	Apply molecular biology techniques to clone genes, express them, and analyze gene function in prokaryotic and eukaryotic systems.	K3	3.0
			CO-3	Analyze vectors and various cloning strategies employed in gene manipulation.	K4	3.0
			CO-4	Analyze the principles and protocols of modern genome-editing tools to understand their application in gene modification experiments.	K4	3.0
			CO-5	Analyze ethical, safety, and regulatory considerations associated with recombinant DNA technology in the context of human and agricultural biotechnology.	K4	2.0
			MMBT 202			2.6
11	MMBT 203	=	CO-1	Describe the fundamental principles of nanotechnology and its applications in biotechnology.	K2	2.0
			CO-2	Analyze the synthesis and characterization of nanoparticles and their biological interactions.	K4	3.0
			CO-3	Apply nanomaterials for the development of nanocarriers and diagnostic tools in biotechnology.	K3	3.0
			CO-4	Analyze the working principles, components, and applications of nano-based biosensors used for the detection of specific biomolecules.	K4	3.0
			CO-5	Analyze the safety, ethical, and regulatory considerations involved in the development and application of nanobiotechnology-based solutions.	K4	2.0
			MMBT 203			2.6
12	MMBT 204	=	CO-1	Explain the fundamental properties of stem cells and their classification.	K2	2.0
			CO-2	Analyze stem cell signalling pathways and the role of microenvironment in stem cell behaviour.	K4	3.0
			CO-3	Demonstrate techniques used in isolation, culture, and characterization of stem cells.	K3	3.0
			CO-4	Analyze various therapeutic applications of stem cells in the context of tissue repair, regeneration, and disease modeling.	K4	3.0
			CO-5	Apply ethical and regulatory principles to understand challenges in stem cell-based clinical research.	K3	2.0
			MMBT 204			2.6
			CO-1	Explain the fundamental properties of stem cells and their classification.	K2	2.0

13	MMBT 251	=	CO-2	Analyze stem cell signalling pathways and the role of microenvironment in stem cell behaviour.	K4	3.0
			CO-3	Demonstrate techniques used in isolation, culture, and characterization of stem cells.	K3	3.0
			CO-4	Analyze various therapeutic applications of stem cells in the context of tissue repair, regeneration, and disease modeling.	K4	3.0
			CO-5	Apply ethical and regulatory principles to understand challenges in stem cell-based clinical research.	K3	2.0
			MMBT 251			2.6
14	MMBT 252	=	CO-1	Demonstrate aseptic techniques and basic molecular biology lab practices.	K3	3.0
			CO-2	Isolate plasmid and genomic DNA from prokaryotic/eukaryotic cells.	K3	3.0
			CO-3	Perform restriction digestion, ligation, and transformation in bacterial systems.	K4	3.0
			CO-4	Analyze recombinant clones using colony PCR, blue-white screening, and gel electrophoresis.	K4	3.0
			CO-5	Analyze the steps and outcomes of gene cloning and protein expression experiments to identify factors affecting success or failure.	K4	3.0
			MMBT 252			3.0
15	MMAE A 202	=	CO-1	Describe and pronounce German alphabets, numbers, and greetings with correct intonation and sound pattern.	K2	1.0
			CO-2	Explain the use of basic grammatical components such as articles, nouns, and verbs in forming simple German n sentences.	K2	1.0
			CO-3	Understand basic information about oneself, family members, and professions in German.	K2	1.0
			CO-4	Illustrate the use of German vocabulary and sentence structures to talk about time, dates, days, and daily routines	K2	1.0
			CO-5	Illustrate comprehension of simple conversations and respond appropriately in role-play scenarios.	K2	1.0
			MMAE A 202			1.0
16	MMNC 101/201	=	CO-1	Understand Spanish alphabets, numbers, greetings, and pronunciation rules.	K2	1.0
			CO-2	Describe vocabulary and expressions related to days, months, seasons, time, and daily routines in Spanish.	K2	1.0
			CO-3	Explain how to introduce oneself and others, including the use of nationalities, professions, and family terms.	K2	1.0
			CO-4	Summarize the use of basic verbs (Ser, Estar, Tener), regular verb conjugations, and sentence structures.	K2	1.0
			CO-5	Summarize basic spoken Spanish by participating in simple conversations, role plays, and situational dialogues.	K2	1.0
			MMNC 101/201			1.0
17	MMBT 351	≡	CO-1	Conduct an in-depth review of recent scientific literature and emerging technologies in biotechnology.	K4	3.0
			CO-2	Critically assess and synthesize research findings to formulate innovative solutions for complex biotechnological problems.	K5	3.0
			CO-3	Present and defend a scientific research topic using appropriate data visualization and advanced communication strategies.	K5	2.0
			CO-4	Develop a well-structured technical manuscript suitable for journal publication or conference proceedings.	K5	3.0

			CO-5	Engage in peer discussions, respond to expert reviews, and integrate constructive feedback into research work.	K5	2.0
			MMBT 351			2.6
18	MMBT 352	III	CO-1	Formulate a research problem, review relevant literature, and design a research methodology in the field of biotechnology.	K5	3.0
			CO-2	Conduct independent research, apply modern biotechnological tools, and generate experimental data with accuracy and reproducibility.	K5	3.0
			CO-3	Analyze, interpret, and critically evaluate research data using appropriate statistical and computational tools.	K5	3.0
			CO-4	Write a comprehensive dissertation with a structured methodology, results, discussion, and conclusion following scientific writing standards.	K5	3.0
			CO-5	Present and defend research findings effectively through seminars, conferences, or peer-reviewed publications.	K5	2.0
			MMBT 352			2.8
19	MMAE 301	III	CO-1	Understand fundamental concepts of quantitative aptitude including numbers, percentages, ratios, and basic algebra.	K2	2.0
			CO-2	Apply arithmetic and algebraic methods to solve problems related to time, work, profit & loss, and data interpretation.	K3	3.0
			CO-3	Apply logical reasoning techniques to solve puzzles, series, coding-decoding, and analytical reasoning problems.	K3	2.0
			CO-4	Analyze complex quantitative and logical problems using appropriate strategies and optimize solution approaches.	K4	3.0
			CO-5	Evaluate problem-solving approaches and develop efficient techniques for competitive examinations and real-life scenarios.	K5	2.0
			MMAE 301			2.4
20	MMNC 101/201	III	CO-1	Understand the concepts, types, causes, and impacts of natural and man-made disasters..	K2	2.0
			CO-2	Explain disaster preparedness, mitigation strategies, and risk reduction measures.	K2	2.0
			CO-3	Apply disaster management techniques including emergency response, evacuation, and relief operations.	K3	3.0
			CO-4	Analyze disaster scenarios using risk assessment tools and develop response plans.	K4	3.0
			CO-5	Evaluate disaster management policies, frameworks, and rehabilitation strategies for sustainable development.	K5	2.0
			MMNC 101/201			2.4
21	MMBT 451	IV	CO-1	Implement the research plan effectively and conduct experiments with precision using advanced biotechnological techniques.	K5	3.0
			CO-2	Analyze and interpret experimental results critically using computational and statistical tools to derive meaningful conclusions.	K5	3.0
			CO-3	Prepare a well-structured dissertation with high-quality scientific writing, adhering to publication standards and ethical guidelines.	K5	3.0
			CO-4	Present and defend research findings confidently in front of an expert panel, incorporating constructive feedback.	K5	2.0
			CO-5	Publish research findings in peer-reviewed journals or present at national/international conferences to contribute to scientific knowledge.	K5	3.0

			MMBT 451			2.8
22	MMAE 506	IV	CO-1	Understand the principles, stages, and tools of design thinking and innovation.	K2	2.0
			CO-2	Apply empathy mapping, ideation techniques, and prototyping methods to identify user-centric solutions.	K3	2.0
			CO-3	Analyze real-world problems to define design challenges and generate innovative ideas.	K4	3.0
			CO-4	Develop prototypes and test solutions using iterative design and feedback mechanisms.	K5	3.0
			CO-5	Create innovative products or solutions addressing societal or industrial needs using design thinking principles.	K6	3.0
			MMAE 506			2.6

Specific Outcomes (PSOs) : M.**Analyze, K5 – Evaluate, K6 –**

PO 2	PO 3	PO 4
Write and present a substantial technical report	Demonstrate a degree of mastery over the area as per the specialization of the program	Conduct investigations of complex problems independently & develop innovative solutions
2.0	3.0	1.0
3.0	2.0	3.0
2.0	2.0	3.0
2.0	2.0	2.0
2.0	3.0	3.0
2.2	2.4	2.4
2.0	3.0	1.0
3.0	2.0	2.0
2.0	2.0	3.0
2.0	2.0	3.0
3.0	3.0	3.0
2.4	2.4	2.4
2.0	3.0	1.0
3.0	2.0	2.0
2.0	2.0	3.0
2.0	2.0	3.0
3.0	3.0	3.0
2.4	2.4	2.4
2.0	3.0	1.0

2.0	2.0	2.0
2.0	2.0	3.0
3.0	3.0	3.0
3.0	2.0	2.0
2.4	2.4	2.2
2.0	2.0	1.0
3.0	2.0	1.0
3.0	2.0	2.0
2.0	2.0	3.0
3.0	3.0	3.0
2.6	2.2	2.0
2.0	2.0	2.0
3.0	2.0	2.0
2.0	2.0	2.0
3.0	2.0	2.0
2.0	2.0	3.0
2.4	2.0	2.2
2.0	2.0	2.0
3.0	2.0	2.0
2.0	2.0	3.0
2.0	2.0	3.0
3.0	2.0	3.0
2.4	2.0	2.6
2.0	2.0	1.0
3.0	2.0	1.0
3.0	2.0	1.0
3.0	2.0	1.0
2.0	3.0	2.0
2.6	2.2	1.2

2.0	3.0	1.0
3.0	2.0	2.0
2.0	2.0	3.0
2.0	3.0	3.0
3.0	3.0	3.0
2.4	2.6	2.4
2.0	3.0	1.0
3.0	2.0	2.0
2.0	2.0	3.0
2.0	3.0	3.0
3.0	2.0	2.0
2.4	2.4	2.2
2.0	3.0	1.0
2.0	2.0	3.0
3.0	2.0	2.0
2.0	3.0	3.0
3.0	2.0	2.0
2.4	2.4	2.2
2.0	3.0	1.0
2.0	2.0	3.0
3.0	2.0	2.0
2.0	3.0	3.0
3.0	2.0	2.0
2.4	2.4	2.2
2.0	3.0	1.0

2.0	2.0	3.0
3.0	2.0	2.0
2.0	3.0	3.0
3.0	2.0	2.0
2.4	2.4	2.2
2.0	2.0	2.0
3.0	2.0	2.0
3.0	2.0	3.0
2.0	2.0	3.0
3.0	3.0	3.0
2.6	2.2	2.6
2.0	2.0	1.0
2.0	2.0	1.0
2.0	2.0	1.0
2.0	2.0	1.0
3.0	2.0	1.0
2.2	2.0	1.0
2.0	2.0	1.0
2.0	2.0	1.0
2.0	2.0	1.0
2.0	2.0	1.0
3.0	2.0	1.0
2.2	2.0	1.0
2.0	2.0	3.0
2.0	3.0	3.0
3.0	2.0	2.0
3.0	3.0	3.0

3.0	2.0	2.0
2.6	2.4	2.6
3.0	3.0	3.0
3.0	3.0	3.0
2.0	3.0	3.0
3.0	3.0	3.0
3.0	2.0	2.0
2.8	2.8	2.8
2.0	2.0	1.0
2.0	2.0	2.0
3.0	2.0	2.0
2.0	3.0	3.0
3.0	3.0	3.0
2.4	2.4	2.2
2.0	2.0	1.0
2.0	2.0	1.0
2.0	2.0	2.0
2.0	3.0	3.0
3.0	3.0	3.0
2.2	2.4	2.0
3.0	3.0	3.0
3.0	3.0	3.0
3.0	3.0	3.0
3.0	2.0	3.0
2.0	3.0	3.0

2.8	2.8	3.0
2.0	2.0	1.0
3.0	2.0	2.0
2.0	3.0	3.0
3.0	3.0	3.0
3.0	3.0	3.0
2.6	2.6	2.4