IMS Engineering College, Ghaziabad

Department of Biotechnology

2020-21

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Course Outcomes (CO) mapping with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

Institute Vision and Mission

Vision

Our vision is to impart Vibrant, Innovative and Global Education to make IMS the world leader in terms of Excellence of Education, Research and to serve the nation in the 21st century.

Mission

- To develop IMSEC as a Centre of Excellence in Technical and Management Education.
- To inculcate in its students the qualities of Leadership, Professionalism, Executive Competence and Corporate understanding.
- To imbibe and enhance Human Values, Ethics and Morals in our students.
- To transform students into Globally Competitive Professionals

Department Vision and Mission

Vision

To be a Centre of Excellence in field of Biotechnology education, research, training and entrepreneurship guided by sound scientific principles, quality teaching and thrust for improvement

Mission

- To develop a strong Biotechnology Engineering program based on quality education, research and training.
- To impart quality education to the students and enhance their skills which will make them globally competitive.
- To develop trained biotechnology professionals who can contribute to the continuous improvement of biotechnological services and products.
- To develop scientific and/or technical resources as per biotechnology industry demands

Program Outcomes

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives

1. To prepare biotechnology graduates for a successful technical and professional career as per the needs of the biotechnology industry.
2. To provide students with a strong foundation in scientific, engineering and mathematical fundamentals necessary to design, analyze and solve technical problems in the biotechnology industry.
3. To inculcate professional and ethical attributes in the students and to promote lifelong learning of attributes related to biotechnology.
4. To encourage students to pursue higher education and research.
5. To develop graduates with enhanced technical acumen, aptitude, communication and professional skills.

Program Specific Outcomes (PSO)

1. Graduate shall have the ability to apply fundamental knowledge of mathematics, biology, biological processes, and the scientific method to solve problems in biotechnology.
2. Graduate shall have the ability to integrate biological knowledge and concepts with the ethical and industrial perspectives of biotechnology and life sciences.
3. Graduate shall have the ability to work in groups or individually to develop written and oral presentations skills for effective communication of scientific concepts. Students are expected to engage in independent and lifelong learning in the context of biotechnological advancements.
4. Graduate shall have the ability to apply major quantitative and computational skills and tools to solve problems in the biotechnology industry.

B.TECH (BIOTECHNOLOGY)

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/ KAS304	Engineering Science Course/Maths V	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE 301	Technical Communication/Universal Human values	2 3	1 0	0 0	30	20	50		100		150	3
3	KBT301	Techniques in Biotechnology	3	1	0	30	20	50		100		150	4
4	KBT302	Microbiology & Immunology	3	1	0	30	20	50		100		150	4
5	KBT303	Biochemistry	3	0	0	30	20	50		100		150	3
6	KBT351	Techniques in Biotechnology Lab	0	0	2				25		25	50	1
7	KBT352	Microbiology & Immunology Lab	0	0	2				25		25	50	1
8	KBT353	Biochemistry Lab	0	0	2				25		25	50	1
9	KBT354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										**950**	**22**

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

IMS Engineering College, Ghaziabad

Sub Code	**KOE-035**
Sub. Name	**Datastructures and Algorithms**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to understand and analyze the time and space complexity of an algorithm	
CO2	The student should be able to understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming).	
CO3	The student should be able to discuss various algorithm design techniques for developing algorithms.	
CO4	The student should be able to discuss various searching, sorting and graph traversal algorithms.	
CO5	The student should be able to understand operation on Queue, Priority Queue, D-Queue.	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	3	-	-	-	-	1	1	3
CO2	3	3	3	3	3	-	-	-	-	2	2	3
CO3	3	3	3	3	3	-	-	-	-	1	3	3
CO4	3	3	3	3	3	-	-	-	-	1	3	3
CO5	3	3	3	3	3	-	-	-	-	1	3	3
Avg	**3**	**3**	**3**	**2.8**	**3**	**-**	**-**	**-**	**-**	**1.2**	**2.4**	**3**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	-	2	3
CO2	3	-	2	3
CO3	3	-	2	3
CO4	3	-	2	3
CO5	3	-	2	3
Avg	**3**	**-**	**2**	**3**

IMS Engineering College, Ghaziabad

Sub Code	**KAS-301**
Sub. Name	**Technical Communication**

COURSE OUTCOMES		**Bloom's Level**
CO1	Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.	
CO2	Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions	
CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.	
CO4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence	
CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	2	-	1	2	1	1	3	3	2	1
CO2	1	2	3	-	3	2	-	-	-	3	2	3
CO3	1	2	3	-	3	2	1	2	3	3	2	3
CO4	2	2	3	1	3	3	-	1	3	3	3	3
CO5	1	1	3	1	1	-	3	3	3	3	1	3
Avg	**1.2**	**1.6**	**2.8**	**1**	**2.2**	**2.25**	**1.66667**	**1.75**	**3**	**3**	**2**	**2.6**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	2	-	3
CO2	-	1	-	3
CO3	2	-	-	3
CO4	1	3	-	3
CO5	-	-	-	1
Avg	**1.5**	**2**	**-**	**2.6**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-301**
Sub. Name	**Techniques in Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to describe Light microscopy-its types, TEM, SEM and Atomic force microscopy.	
CO2	The student should be able to analyze the Principle, Operations and types of Chromatography.	
CO3	The student should be able to explain the theory of Electrophoresis, its types and Western Blotting.	
CO4	The student should be able to elucidate the General principles of electromagnetic radiation, Types of spectra , UV-VIS spectrophotometer, Atomic absorption and Atomic emission spectroscopy and X-Ray spectroscopy.	
CO5	The student should be able to describe NMR, ESR, Circular dichroism (CD) principles, Basics of IR and X-Ray diffraction analysis.	
CO6	The student should be able to analyze the bioprinting and biosensor processes	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	3	2	2	2	1	1	-	-	2
CO2	2	3	2	3	2	2	1	1	2	1	1	2
CO3	3	3	2	2	2	2	2	1	2	1	1	2
CO4	2	3	3	2	3	2	2	1	1	-	-	2
CO5	3	3	2	2	3	2	1	1	1	-	-	2
CO6	2	2	2	2	2	1	2	1	2	-	-	2
Avg	**2.5**	**2.67**	**2.17**	**2.33**	**2.33**	**1.83**	**1.67**	**1**	**1.5**	**1**	**1**	**2**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	2
CO2	3	2	2	2
CO3	3	3	2	3
CO4	3	2	2	2
CO5	3	2	2	3
CO6	3	2	2	2
Avg	3	2.17	2	2.33

IMS Engineering College, Ghaziabad

Sub Code	**KBT-302**
Sub. Name	**Microbiology & Immunology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Student should be able to describe the process of isolation, identification of microorganisms and their preservation, physical and chemical control methods for sterilization.	
CO2	Student should be able to explain about the bacterial genetic recombination, bacterial photosynthesis and nitrogen fixation, Virus structure and its reproduction cycle	
CO3	Student should be able to describe the immunity and its types, major cells and organs of the immune system, different types of antigens & antibodies, production of monoclonal antibody	
CO4	Student should be able to describe the structure and function of MHC molecules and its role in process of antigen presentation, cytokines and complement system, ELISA, RIA, Western blotting	
CO5	Student should be able to describe the role of microorganism in waste water management, bioremediation and in causing various pathogenic diseases.	
CO6	Student should be able to summarize the mechanism of immunity against the infectious diseases, vaccines, hypersensitivity and immunotherapy.	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	2	-	2	2	-	2	-	-	2
CO2	2	2	1	2	-	2	2	-	2	-	-	2
CO3	2	2	1	1	-	1	1	-	2	-	-	2
CO4	3	3	2	1	-	2	1	-	2	-	-	2
CO5	2	2	1	2	-	1		-	2	-	-	1
CO6	2	1	1	1	-	1	1	-	2	-	-	1
Avg	**2.33**	**2.00**	**1.17**	**1.50**	**-**	**1.50**	**1.40**	**-**	**2.00**	**-**	**-**	**1.67**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2
CO2	3	2	1	1
CO3	2	2	2	-
CO4	3	3	3	3
CO5	2	2	1	1
CO6	1	2	1	1
Avg	2.33	2.33	1.67	1.60

IMS Engineering College, Ghaziabad

Sub Code	**KBT-303**
Sub. Name	**Biochemistry**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to relate the importance of water in biological system and to describe the role of biological buffer.	
CO2	The student should be able to describe structure & function of major biomolecules found in cells, that make them indispensable for life.	
CO3	The student should be able to explain energy generation through carbohydrate metabolism and related diseases	
CO4	The student should be able to describe energy generation through lipid metabolism and related diseases	
CO5	The student should be able to explain the metabolic pathways of amino acids and proteins and related diseases	
CO6	The student should be able to discuss the role of nucleic acids in various metabolic activities and disorders	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	1	-	-	-	2	3	1	3
CO2	2	2	1	2	1	-	-	-	1	3	1	3
CO3	3	3	1	2	1	1	-	-	1	3	1	3
CO4	3	3	1	2	1	1	-	-	1	3	1	3
CO5	2	2	1	2	1	1	-	-	1	3	1	3
CO6	2	2	1	2	1	1	-	-	1	3	1	3
Avg	**2.33**	**2.33**	**1.00**	**2.17**	**1.00**	**1.00**	**#DIV/0!**	**#DIV/0!**	**1.17**	**3.00**	**1.00**	**3.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1
CO2	2	1	2	1
CO3	3	1	2	1
CO4	3	1	2	1
CO5	3	1	2	1
CO6	3	1	2	1
Avg	**2.67**	**1.00**	**2.00**	**1.00**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-351**
Sub. Name	**Techniques in Biotechnology Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to understand precession , accuracy and spectroscopy	
CO2	The student should be able to understand and use microscopy and paper chromatography	
CO3	The student should be able to understand and perform SDS-PAGE and agarose gel electrophoresis	
CO4	The student should be able to understand membrane separation techniques	
CO5	The student should be able to liquid-liquid separation experiments	
CO6	The student should be able to column chromatography	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1		3	2	3	2	2	2		2
CO2	2	2	2		2	2	2	2	2	2		2
CO3	2	2	1		2	2	1	2	2	2		2
CO4	2	2	1		2	2	1	2	1	2		2
CO5	2	2	1		1	2	2	2	1			2
CO6	3	1	1		2	2	2	2	1	2		2
Avg	**2.17**	**2.00**	**1.17**	**#DIV/0!**	**2.00**	**2.00**	**1.83**	**2.00**	**1.50**	**2.00**	**#DIV/0!**	**2.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	1	2		1
CO2	1	2		1
CO3	1	2		1
CO4	1	2		1
CO5	1	2		1
CO6		1		1
Avg	**2.00**	**1.83**	**#DIV/0!**	**1.00**

Sub Code	**KBT-352**
Sub. Name	**Microbiology & Immunology Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	Students should be able to apply the principle and application of the equipment and tools used in microbiology laboratory.	
CO2	Students should be able to perform various pure culture techniques used for the isolation and purification of microorganisms.	
CO3	Students should be able to perform the simple and differential staining for the microscopic identification of microorganism.	
CO4	Students should be able to identify the type of blood group using the standard kit method.	
CO5	Students will be able to apply the principles and perform the procedure of immunodiffusion.	
CO6	Students should be able to measure the concentration of antigen or antibody in serum sample by using immunological assays.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	1	-	3	1	1	1	-	2	1
CO2	1	1	2	1	3	1	-	-	2	1	2	2
CO3	1	1	-	2	-	1	1	-	1	2	-	-
CO4	-	2	1	1	-	1	-	-	-	1	1	2
CO5	1	1	-	2	-	1	1	-	1	2	-	-
CO6	2	-	-	1	-	3	1	1	1	-	2	1
Avg	**1.40**	**1.25**	**1.50**	**1.33**	**3.00**	**1.67**	**1.00**	**1.00**	**1.20**	**1.50**	**1.75**	**1.50**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1
CO2	2	3	1	2
CO3	2	2	-	1
CO4	2	1	1	1
CO5	2	3	1	2
CO6	3	1	1	1
Avg	**2.33**	**1.83**	**1.00**	**1.33**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-353**
Sub. Name	**Biochemistry Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to perform quantitative and qualitative analysis of biomolecules.	
CO2	The student should be able to do the calculations associated with practical work like dilutions, unit conversions and solutions of different concentrations.	
CO3	The student should be able to perform the separation of solutes using chromatographic techniques	
CO4	The student should be able to perform molecular analysis of DNA using agarose gel electrophoresis	
CO5	The student should be able to design, execute and analyse a biochemistry experiment and make its report.	
CO6	The student should be able to perform experiment using safe and good laboratory processes individually or as a team.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	-	-	-	-	2	1	-	1
CO2	2	2	1	1	-	-	-	-	1	-	-	1
CO3	1	1	1	2	1	-	-	-	2	1	-	1
CO4	2	1	2	1	-	-	-	-	2	1	-	1
CO5	2	2	3	2	-	-	-	-	2	1	-	1
CO6	1	1	2	-	-	2	2	-	-	-	-	1
Avg	1.67	1.50	1.67	1.40	1.00	2.00	2.00	-	1.80	1.00	-	1.00

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	3	2	2	2
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1
CO6	2	2	2	1
Avg	**2.83**	**2.00**	**2.00**	**1.50**

SEMESTER- IV													
Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS404/ KOE041-48	Maths V/Engineering Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/ Technical Communication	3 2	0 1	0 0	30	20	50		100		150	3
3	KBT401	Bioprocess Engineering I	3	0	0	30	20	50		100		150	3
4	KBT402	Genetics & Molecular Biology	3	1	0	30	20	50		100		150	4
5	KBT403	Enzyme Engineering	3	1	0	30	20	50		100		150	4
6	KBT451	Bioprocess Engineering I Lab	0	0	2				25		25	50	1
7	KBT452	Genetics & Molecular Biology Lab	0	0	2				25		25	50	1
8	KBT453	Enzyme Engineering Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										**900**	**21**

IMS Engineering College, Ghaziabad

Sub Code	**KAS-404**
Sub. Name	**Elementary Mathematics - III**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to understand the concept of Fourier Transform and Z-Transform to apply for solving with the help of transform problems.	
CO2	The student should be able to remember the concept of Probability to evaluate Probability distribution.	
CO3	The student should be able to analyze the concept of numerical techniques to evaluate the zero's of the function interpolation	
CO4	The student should be able to apply the concept of hypothesis to evaluate various hypothesis testing.	
CO5	The student should be able to remember the concept of design and statistical quality control to create control charts.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	-	-	-	-	-	-	2
CO2	3	2	3	2	2	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2
CO5	2	2	1	-	-	-	-	-	-	-	-	1
Avg	**2.8**	**2.2**	**2.2**	**2.5**	**1.5**	-	-	-	-	-	-	**1.8**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	1	-	3
CO2	3	-	-	3
CO3	2	-	-	3
CO4	3	-	-	3
CO5	2	1	-	3
Avg	**2.6**	**1**	**-**	**3**

IMS Engineering College, Ghaziabad

Sub Code	**KVE-401**
Sub. Name	**Universal Human Values**

COURSE OUTCOMES		**Bloom's Level**
CO1	Students should be able to realize the importance & need of human values and value education to human being.	
CO2	Students should be able to realize the importance of self-exploration in harmony of family.	
CO3	They should be able to understand and appreciate role of harmonious family in peaceful society.	
CO4	Students who complete this course should be able to investigate his/her self & make it suitable to society and existence.	
CO5	Students should be able to apply the ethical and human values in family, society, nature and professional life.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	-	-	-	-	2
CO2	-	-	-	-	-	3	2	2	-	-	-	-
CO3	-	-	-	-	-	3	2	-	2	-	-	-
CO4	-	-	-	-	-	-	2	2	-	-	-	-
CO5	-	-	-	-	-	-	3	3	-	-	-	2
Avg	-	-	-	-	-	**3**	**2.2**	**2.2**	**2**	-	-	**2**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-
CO2	2	2	1	-
CO3	2	1	1	-
CO4	1	1	1	-
CO5	1	1	1	-
Avg	**2**	**1.5**	**1**	-

IMS Engineering College, Ghaziabad

Sub Code	**KBT-401**
Sub. Name	**Bioprocess Engineering I**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to calculate the rate of heat transfer in conduction, convection and radiation through different surfaces	
CO2	The student should be able to design and analyze the performance of heat exchangers and evaporators.	
CO3	The student should be able to identify and analyse the mechanism of diffusional mass transfer.	
CO4	The student should be able to understand the basic fluid properties, flow forces, and flow regime	
CO5	The student should be able to understand the basic concepts of manometer, venturimeter, orifice meter	
CO6	the student should be able to understand the working of reciprocal and centrifugal pumps	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	-	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	-	1
CO4	3	1	2	1	1	-	-	-	1	-	1	1
CO5	3	3	3	3	3	-	-	-	1	-	1	1
CO6	3	3	2	3	2	-	-	-	1	-	1	1
Avg	**3.00**	**2.67**	**2.67**	**2.17**	**2.00**	**-**	**-**	**-**	**1.00**	**-**	**1.00**	**1.17**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	-	2
CO2	3	2	1	2
CO3	3	2	1	2
CO4	3	2	1	-
CO5	3	2	1	-
CO6	2	1	2	-
Avg	**2.83**	**1.83**	**1.20**	**2.00**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-402**
Sub. Name	**Genetics and Molecular Biology**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to discuss the basics of heredity and variation.	
CO2	The student should be able to illustrate the organization of genome.	
CO3	The student should be able to describe the linkage, recombination and two-point and three-point test crosses.	
CO4	The student should be able to analyze the mechanism of DNA replication, transcription and translation processes taking place in eukaryotes and prokaryotes.	
CO5	The student should be able to distinguish the various checkpoints in cell cycle which prevent cancer and understand its regulation along with apoptosis.	
CO6	The student should be able to illustrate the Gene cloning and r-DNA technology along with its industrial applications.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2	1	2	1	2	1	2	2
CO2	2	1		3	1	2	2	2	2	2	3	1
CO3	1	2	2		2	3	2	2	3	2	2	2
CO4	2	2		3	2	2	1	2	1	3	2	1
CO5	2	3	2	1	3	2	3	3	2	2	1	2
CO6	2	2			1	1	2	1	3	1	1	2
Avg	**1.83**	**2.00**	**2.00**	**2.33**	**1.83**	**1.83**	**2.00**	**1.83**	**2.17**	**1.83**	**1.83**	**1.67**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1
CO2	3	1	2	1
CO3	2	1	3	2
CO4	2	2	1	2
CO5	3	1	2	2
CO6	2	3	2	1
Avg	**2.50**	**1.67**	**2.00**	**1.50**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-403**
Sub. Name	**Enzyme Engineering**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to describe structure, function, activity and kinetics of enzymes.	
CO2	The student should be able to describe the various factors and modes of enzyme inhibition and regulation and incorporate them in industrial applications.	
CO3	The student should be able to summarize processes involved in extraction and purification of enzymes and develop enzyme assays for research and industry.	
CO4	The student should be able to describe and apply enzymes immobilization techniques.	
CO5	The student should be able to discuss and assemble biosensors important to industries, healthcare and environment.	
CO6	The student should be able to discuss and design different types of bioreactors using immobilized enzymes.	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	3	1	-	-	-	1	3	-	2
CO2	3	3	2	3	1	-	-	-	1	3	-	2
CO3	3	3	2	3	3	1	1	1	3	3	2	3
CO4	3	3	2	3	3	1	1	-	3	3	2	3
CO5	3	3	3	3	3	2	2	1	3	3	2	3
CO6	3	3	3	3	3	1	1	-	3	3	2	3
Avg	**2.83**	**2.83**	**2.33**	**3.00**	**2.33**	**1.25**	**1.25**	**1.00**	**2.33**	**3.00**	**2.00**	**2.67**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	-	3	2
CO2	3	-	3	2
CO3	3	2	3	2
CO4	3	2	3	2
CO5	3	2	3	2
CO6	3	2	3	2
Avg	**3.00**	**2.00**	**3.00**	**2.00**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-451**
Sub. Name	**Bioprocess Engineering I (Lab)**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to perform an experiment to calculate the thermal conductivity metal rod	
CO2	The student should be able to perform an experiment of heat exchangers to understand the concept of heat transfer	
CO3	The student should be able to perform an experiment dealing thermal conductivity of insulating powder	
CO4	The student should be able to perform an experiment using venturimeter and manometer to understand the pressure drop concept in pipes	
CO5	The student should be able to understand an experimental approach for the calculation of surface tension of fluids	
CO6	The student should be able to understand velocity profile of fluid through Pitot Tube	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	3	-	-	-	-	-	-	-	2
CO2	3	2	3	3	1	-	-	-	-	-	-	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1
CO4	3	2	2	-	1	-	-	-	1	-	1	1
CO5	3	2	3	3	2	-	-	-	1	-	1	1
CO6	2	2	2	3	2	-	-	-	1	-	1	1
Avg	**2.83**	**2.00**	**2.33**	**2.80**	**1.60**	**-**	**-**	**-**	**1.00**	**-**	**1.00**	**1.17**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	-	2
CO2	3	1	1	2
CO3	3	2	1	2
CO4	3	1	1	1
CO5	3	2	1	-
CO6	2	2	2	1
Avg	**2.83**	**1.67**	**1.20**	**1.60**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-452**
Sub. Name	**Genetics and Molecular Biology Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to understand basic genetics principles and real life implementation	
CO2	The student should be able to comprehend DNA and its components	
CO3	The student should be able to correlate with genomic composition in an organism	
CO4	The student should be able to understand isolation of DNA and its visualization	
CO5	The student should be able to perform and manage DNA experiments	
CO6	The student should be able to design experiments related to DNA	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	3	2	1	1	-	-	-	1
CO2	2	3	2	2	3	2	-	1	2	2	1	1
CO3	2	2	2	2	3	-	3	1	-	-	2	1
CO4	3	3	2	2	3	-	2	1	2	3	1	1
CO5	2	3	2	2	3	3	-	3	3	1	2	1
CO6	3	1	1	1	1	-	-	3	-	-	-	3
Avg	**2.17**	**2.33**	**1.83**	**1.83**	**2.67**	**2.33**	**2.00**	**1.67**	**2.33**	**2.00**	**1.50**	**1.33**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	1
CO2	2	3	3	1
CO3	2	3	3	1
CO4	2	3	3	1
CO5	2	3	3	1
CO6	1	3	3	1
Avg	**1.83**	**3.00**	**2.83**	**1.00**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-453**
Sub. Name	**Enzyme Engineering Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to extract enzyme from plant and microbial source	
CO2	The student should be able to perform partial purification methods and quantification of enzyme	
CO3	The student should be able to demonstrate effect of temperature on enzyme activity	
CO4	The student should be able to demonstrate effect of pH and time on enzyme activity	
CO5	The student should be able to demonstrate effect of substrate and enzyme concentration on enzyme activity	
CO6	The student should be able to describe methods of immobilization of enzymes	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	2	-	-	-	3	1	-	-
CO2	1	1	1	3	3	-	-	-	3	2	1	1
CO3	2	2	1	3	3	-	-	-	3	2	1	1
CO4	2	2	1	3	3	-	-	-	3	2	1	1
CO5	2	2	1	3	3	-	-	-	3	2	1	1
CO6	1	1	1	3	3	-	-	-	3	2	1	2
Avg	**1.60**	**1.60**	**1.00**	**3.00**	**2.83**	**-**	**-**	**-**	**3.00**	**1.83**	**1.00**	**1.20**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	-	1	3	-
CO2	1	1	3	1
CO3	2	1	3	1
CO4	2	1	3	1
CO5	2	1	3	1
CO6	1	1	3	1
Avg	**1.60**	**1.00**	**3.00**	**1.00**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW
B.TECH III YEAR V SEMESTER BIOTECHNOLOGY

SEMESTER- V SESSION2020-21

Sl. No	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KBT 501	**Genetic Engineering**	3	1	0	30	20	50		100		150	4
2	KBT 502	**Fermentation Biotechnology**	3	1	0	30	20	50		100		150	4
3	KBT 503	**Bioinformatics I**	3	1	0	30	20	50		100		150	4
4	KBT 051-054	Departmental Elective-I	3	0	0	30	20	50		100		150	3
5	KBT 055-058	Departmental Elective-II	3	0	0	30	20	50		100		150	3
6	KBT 551	**Genetic Engineering lab**	0	0	2				25		25	50	1
7	KBT 552	Fermentation Technology Lab	0	0	2				25		25	50	1
8	KBT 553	**Bioinformatics- I virtual lab**	0	0	2				25		25	50	1
9		Mini Project or Internship Assessment*	0	0	2				50			50	1
10	KNC501/ KNC502	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
11		MOOCs (Essential for Hons. Degree)											
		Total	**17**	**3**	**8**							**950**	**22**

*The Mini Project or internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

IMS Engineering College, Ghaziabad

Sub Code	**KBT-501**
Sub. Name	**Genetic Engineering**

COURSE OUTCOMES		**Bloom's Level**
CO1	To be able to appraise proper use of host and vector for gene cloning	
CO2	Identification of appropriate method for DNA delivery into the host	
CO3	Use of gene library for screening of desired sequence/protein	
CO4	Cloning process of whole organism and applications	
CO5	Process of recombinant protein expression, cell signalling and ethical issues related to gene transfer	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	3	-	-	1	-	-	-	1
CO2	2	3	2	2	3	-	-	1	-	-	-	1
CO3	2	3	2	2	3	-	-	1	-	-	-	1
CO4	3	3	2	2	3	-	-	1	-	-	-	1
CO5	2	3	2	2	3	-	-	3	-	-	-	1
Avg	**1**	**2**	**2**	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**1**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	1
CO2	2	3	3	1
CO3	2	3	3	1
CO4	2	3	3	1
CO5	2	3	3	1
Avg	**2**	**3**	**2.8**	**1**

Sub Code	**KBT-502**
Sub. Name	**Fermentation Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Student will be able to understand the concepts and process technologies of fermentation	
CO2	Student will be able to learn the application and use of different raw materials and its use in industrial scale production	
CO3	Student will be able to understand the regulatory system in the microorganism	
CO4	Student will be able to learn the strain improvement technologies and its role in Fermentation	
CO5	Student will be able to learn the concepts of the scale up and scale down criteria of fermentation process and production of metabolites	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	1	-	-	1
CO2	3	2	2	3	2	-	-	-	-	-	-	1
CO3	3	2	2	3	2	-	-	-	-	-	-	1
CO4	3	2	2	3	2	-	-	-	-	-	-	1
CO5	3	3	3	2	1	-	-	-	1	1	-	1
Avg	**3**	**2.4**	**2.4**	**2.6**	**1.6**	**-**	**-**	**-**	**1**	**1**	**-**	**1**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1
CO2	3	1	1	1
CO3	3	1	1	1
CO4	3	1	1	1
CO5	3	2	2	1
Avg	**3**	**1.4**	**1.4**	**1**

Sub Code	**KBT-503**
Sub. Name	**Bioinformatics-1**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand concepts and application of Bioinformatics, types of databases, sequence similarity, sequence patterns and profiles	
CO2	Use sequence alignment techniques, database searching, pairwise and multiple sequence alignment using various tools.	
CO3	Understand scoring matrices and its types including PAM , BLOSUM series and matrices for nucleic acid and protein sequences.	
CO4	Apply phylogeny and its concepts in molecular evolution and different methods of Phylogenetic tree construction	
CO5	Understand and apply the protein structure prediction and application of bioinformatics in drug designing	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	1	1	3	1	-	-	-	-	1	1
CO2	1	1	1	1	2	1	-	2	-	-	1	1
CO3	3	3	2	1	2	-	-	-	-	-	1	1
CO4	3	2	2	2	3	-	-	-	-	-	1	1
CO5	2	3	2	2	3	-	-	-	-	-	1	1
Avg	**2**	**2**	**1.6**	**1.4**	**2.6**	**1**	**-**	**2**	**-**	**-**	**1**	**1**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	-	3
CO2	2	2	-	3
CO3	3	-	1	3
CO4	3	-	1	3
CO5	3	-	1	3
Avg	**2.6**	**1.5**	**1**	**3**

Sub Code	**KBT-052**
Sub. Name	**Nano Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Explain and demonstrate the basics of nanoscience, nanobiotechnology and its techniques	
CO2	Understand the synthesise of metal nanoparticles by chemical process.	
CO3	Perform the biological synthesis of metal nanoparticles.	
CO4	Estimate the toxicity, antibacterial property of metal nanoparticles.	
CO5	Understand the synthesize the carbon nanotubes from carbon source	
CO6	Explain the nano characterization tools and techniques	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	1	1	-	-	-	-	2
CO2	2	1	2	2	-	1	2	-	-	-	-	2
CO3	2	1	1	1	-	2	1	-	-	-	-	2
CO4	1	1	1	2	-	2	1	-	-	-	-	2
CO5	1	2	2	2	-	1	1	-	-	-	-	2
CO6	1	2	2	2	-	1	2	-	-	-	-	2
Avg	**1.5**	**1.5**	**1.67**	**1.83**	**-**	**1.33**	**1.33**	**-**	**-**	**-**	**-**	**2**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	-
CO2	2	2	1	-
CO3	2	2	1	-
CO4	1	1	1	-
CO5	2	1	1	-
CO6	2	1	1	-
Avg	**1.83**	**1.33**	**1**	**-**

IMS Engineering College, Ghaziabad

Sub Code	**KBT053**
Sub. Name	**Biomedical instrumentation**

COURSE OUTCOMES		**Bloom's Level**
CO1	Explain and demonstrate the instrumentation involved in biomedical.	
CO2	Understand the working and application of plethysmography, electrocardiography and pacemakers etc.	
CO3	Explain the ultrasonic measurements, biotelemetry and other related instrumentation.	
CO4	Applications of Instrumentation for the clinical laboratory.	
CO5	Explain the Medical Imaging equipments and electrical safety of medical equipments.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	2	2	-	-	-	1	1	1	1
CO2	3	1	-	3	3	-	-	-	1	1	1	-
CO3	2	2	1	2	3	-	-	-	-	1	1	-
CO4	2	2	1	1	3	-	-	-	-	1	1	1
CO5	3	2	-	1	1	1	-	1	-	1	1	-
Avg	**2.40**	**1.60**	**1.00**	**1.80**	**2.40**	**1.00**	**-**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	-	1	-
CO2	1	-	-	1
CO3	1	-	1	1
CO4	1	1	-	-
CO5	2	1	1	-
Avg	**1.40**	**1.00**	**1.00**	**1.00**

IMS Engineering College, Ghaziabad

Sub Code	**KBT 055**
Sub. Name	**Biofuels & Alcohol Technology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Student will be able to explain the basic concepts of metabolism and importance of metabolic engineering	
CO2	Student will be able to understand the production of metabolites and its regulatory mechanism	
CO3	Student will be able to explain the applications, specificity and product inhibition of bioconversion	
CO4	Student will be able to understand the concept of regulation of enzyme production and strain improvement	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	-	-	-	-	-	-	2
CO2	3	2	3	3	2	-	-	-	-	-	-	1
CO3	3	2	3	3	2	-	-	-	1	1	-	1
CO4	3	2	3	3	2	-	-	-	1	1	-	1
Avg	**3**	**2.25**	**2.75**	**3**	**2**	**-**	**-**	**-**	**1**	**1**	**-**	**1.25**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-
CO2	3	1	1	1
CO3	3	1	1	1
CO4	3	1	1	2
Avg	**3**	**1.25**	**1**	**1.33**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-058**
Sub. Name	**Molecular Modelling and Drug Design**

COURSE OUTCOMES		**Bloom's Level**
CO1	Explain basic concepts and application of molecular modeling and drug development	
CO2	Understand the application of molecular dynamics, molecular mechanism and its application in protein folding	
CO3	Explain the concept and application of homology modeling	
CO4	Apply the knowledge of molecular modeling in drug designing and development	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	-	-	-	-	-	1
CO2	3	2	3	3	3	-	-	-	-	-	-	1
CO3	2	3	3	3	3	-	-	-	-	-	-	1
CO4	2	3	2	3	3	-	-	-	-	-	-	1
Avg	**2.5**	**2.75**	**2.5**	**2.75**	**2.75**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3
CO2	2	3	1	2
CO3	3	3	2	3
CO4	3	3	1	2
Avg	**2.75**	**3**	**1.25**	**2.5**

Sub Code	**KBT-551**
Sub. Name	**Genetic Engineering Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	Demonstrate the isolation of genetic material	
CO2	Perform experiments relating to cloning, ligation, restriction digestion and transformation, etc	
CO3	Demonstrate the southern blotting for identification of desired DNA in a pool DNA sample	
CO4	Perform the bacterial cell competent for transformation	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	2	-	-	1	2	1	-	2
CO2	2	3	3	3	2	-	-	1	2	1	-	2
CO3	2	3	3	3	2	-	-	1	2	1	-	2
CO4	2	3	3	3	2	-	-	1	2	1	-	2
Avg	**2**	**3**	**3**	**3**	**2**	**-**	**-**	**1**	**2**	**1**	**-**	**2**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	3	3	2	1
CO3	3	3	2	1
CO4	3	3	3	2
Avg	**3**	**3**	**2.25**	**1.25**

Sub Code	**KBT-552**
Sub. Name	**Fermentation Biotechnology Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	Student will be able to demonstrate the growth pattern of E.coli	
CO2	Student will be able to perform experiments related to production of antibiotics, enzymes and acids through fermentation process	
CO3	Student will be able to demonstrate the downstream processing of fermentative products	
CO4	Student will be able to perform the solid state fermentation and submerged fermentation	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	-	-	-	-	-	-	-	2
CO2	3	2	3	3	2	-	-	-	-	-	-	1
CO3	3	2	2	3	2	-	-	-	1	1	-	1
CO4	3	2	2	2	1	-	-	-	**1**	1	-	1
Avg	**3**	**2**	**2.5**	**2.75**	**1.66**	**-**	**-**	**-**	**1**	**1**	**-**	**1.25**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-
CO2	3	1	1	1
CO3	3	2	1	1
CO4	2	2	2	2
Avg	**2.75**	**1.75**	**1.33**	**1.33**

Sub Code	**KBT-553**
Sub. Name	**Bioinformatics-1 Virtual Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	Demonstrate the retrieval of sequence data	
CO2	Perform experiments related to locating chromosome and gene expression data.	
CO3	Demonstrate the data retrieval system of PubMed.	
CO4	Perform the ORF finding and retrieval of gene information	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	2	-	-	1	-	-	1	1
CO2	2	1	2	1	2	-	-	1	-	-	1	1
CO3	1	1	1	1	2	-	-	1	-	-	1	1
CO4	2	1	2	1	2	-	-	1	-	-	1	1
Avg	**1.5**	**1**	**1.5**	**1**	**2**	**-**	**-**	**1**	**-**	**-**	**1**	**1**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	1
CO2	3	-	1	3
CO3	2	-	-	1
CO4	3	-	1	3
Avg	**2.5**	**-**	**1**	**2**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW
B.TECH III YEAR VI SEMESTER BIOTECHNOLOGY

SEMESTER-VI												SESSION2020-21	
Sl. No	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KBT-601	Bioprocess Engineering -II	3	1	0	30	20	50		100		150	4
2	KBT-602	Plant Biotechnology	3	1	0	30	20	50		100		150	4
3	KBT-603	Bioinformatics -II	3	1	0	30	20	50		100		150	4
4	KBT-061 To 064	Departmental Elective-III	3	0	0	30	20	50		100		150	3
5		Open Elective-I	3	0	0	30	20	50		100		150	3
6	KBT-651	Bioprocess Engineering –II Lab	0	0	2				25		25	50	1
7	KBT-652	Plant Biotechnology Lab	0	0	2				25		25	50	1
8	KBT-653	Bioinformatics-II Lab	0	0	2				25		25	50	1
9	KNC601/ KNC602	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
10		MOOCs (Essential for Hons. Degree)											
		Total	0	3	6							900	21

IMS Engineering College, Ghaziabad

Sub Code	**KBT-601**
Sub. Name	**Bioprocess Engineering-II**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand the kinetics of microbial growth and the associated parameters.	
CO2	Utilize sterilization concepts necessary for proper bioreactor operation.	
CO3	Discuss the basics of ideal reactor operation.	
CO4	Explain the concept and mechanism of mass transfer in bioprocessing.	
CO5	Analyze the concept of bioreactor control mechanism and identify suitable control system.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	2
CO2	3	3	3	-	-	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2
Avg	**3**	**3**	**3**	**2.67**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	2
CO2	3	3	-	-
CO3	3	3	2	2
CO4	3	-	-	-
CO5	3	3	2	3
Avg	**3**	**3**	**2**	**2.33**

IMS Engineering College, Ghaziabad

Sub Code	**KBT-602**
Sub. Name	**Plant Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Student will be able to understand the principle and basic requirements for plant tissue culture	
CO2	Students will be able to explain the difference between tissue and organ culture and their applicability	
CO3	Students will be able to understand haploid culture and in vitro selection of mutants.	
CO4	Student will be able to analyze somaclonal variation for improved crop varieties in vitro cultures.	
CO5	Student will be able to identify suitable cryopreservation and reculture technique for the cultured tissue	
CO6	Students will be able to understand the development of transgenic plants through genetic manipulations	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	2	-	-	2	-	2	-	1	1
CO2	1	2	2	2	1	2	1	-	1	1	1	2
CO3	1	2	2	2	2	1	1	-	2	-	1	1
CO4	1	1	1	1	2	1	1	-	1	-	1	1
CO5	2	2	2	2	2	1	1	-	1	-	-	1
CO6	3	2	2	2	3	1	1	1		1	-	1
Avg	**1.50**	**1.67**	**1.83**	**1.83**	**2.00**	**1.20**	**1.17**	**1.00**	**1.40**	**1.00**	**1.00**	**1.17**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1	1
CO2	1	2	1	1
CO3	2	2	1	1
CO4	2	2	1	2
CO5	2	1	1	1
CO6	3	2	1	3
Avg	**2.00**	**2.00**	**1.00**	**1.50**

Sub Code	**KBT-603**
Sub. Name	**Bioinformatics-II**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand the various tools and techniques related to insilico modeling of biomolecules along with methods of drug designing, protein docking	
CO2	Analyze problems related to collection and analysis of biological data .	
CO3	Develop steady and time dependent solutions along with their limitations	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	-	-	-	-	-	-	1
CO2	3	3	2	3	2	1	-	-	-	-	-	1
CO3	3	3	3	2	3	3	2	1	-	-	-	1
Avg	**3**	**3**	**2.33**	**2.33**	**2.67**	**2**	**2**	**1**	**-**	**-**	**-**	**1**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2
CO2	2	2	3	3
CO3	3	3	3	3
Avg	**2.33**	**2.67**	**2.67**	**2.67**

Sub Code	**KBT-061**
Sub. Name	**Animal Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand basics of animal tissue culture and its importance	
CO2	Understand techniques to establish animal cell cultures in vitro as well as different types of reactors and their working	
CO3	Learn the strategies involved in developing clones in lab	
CO4	Understand the methods of transgene delivery and production of transgenic animals	
CO5	Understand the process of stem cell differentiation and their applications with case studies	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	1	2	-	1	1	-	-	-	-	2
CO2	1	-	1	3	-	1	1	1	-	-	-	1
CO3	2	1	2	1	1	2	1	1	1	-	-	2
CO4	2	1	1	-	-	1	2	2	-	-	-	1
CO5	1	-	1	1	-	1	2	1	-	-	-	1
Avg	**1.5**	**1**	**1.2**	**1.75**	**1**	**1.2**	**1.4**	**1.25**	**1**	**-**	**-**	**1.4**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1
CO2	3	3	2	1
CO3	3	3	2	2
CO4	3	3	2	1
CO5	2	2	2	1
Avg	**2.6**	**2.6**	**1.8**	**1.2**

Sub Code	**KBT-063**
Sub. Name	**Food Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand importance of microbes and their products in food industry	
CO2	Acquire knowledge of types of foods and their production methodologies	
CO3	Learn the Hazard Analysis Critical Control Point System (HACCP system) and Predictive Microbiology/Microbial Modelling.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	-	-	1	1	-	-	1	1	1
CO2	3	2	3	2	2	1	1	1	-	-	1	2
CO3	3	3	2	2	2	-	2	1	1	1	1	3
Avg	**2.33**	**2.66**	**2.0**	**1.33**	**1.33**	**0.66**	**1.33**	**0.66**	**0.33**	**0.66**	**1.0**	**2.0**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2
CO2	3	1	-	2
CO3	2	2	1	3
Avg	2.66	1.66	0.66	2.33

Sub Code	**KOE-069**
Sub. Name	**Understanding the Human Being Comprehensively – Human Aspirations and its Fulfillment**

COURSE OUTCOMES		**Bloom's Level**
CO1	The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.	
CO2	It is free from any dogma or set of do's and don'ts related to values.	
CO3	It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.	
CO4	This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.	
CO5	This self-exploration also enables them to critically evaluate their pre- conditionings and present beliefs.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	1	2	3	2	2	1	-	3
CO2	-	-	1	-	1	-	2	3	1	-	-	2
CO3	-	1	-	-	2	2	2	3	2	1	-	2
CO4	1	-	-	-	2	-	2	2	2	1	1	1
CO5	-	-	1	2	-	2	2	2	2	1	-	2
Avg	**1**	**1**	**1**	**2**	**1.5**	**2**	**2.2**	**2.4**	**1.8**	**1**	**1**	**2**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	-	1	-
CO2	1	1	-	-
CO3	2	1	-	-
CO4	1	-	-	-
CO5	2	2	-	-
Avg	**1.6**	**1.33**	**1**	-

Sub Code	**KBT-651**
Sub. Name	**Bioprocess Engineering-II Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	Analyze the data on growth kinetics of E.coli.	
CO2	Discuss the upstream and downstream bioprocessing for citric acid and α- amylase production.	
CO3	Analyze the volumetric liquid mass transfer coefficient (KLa) using sodium sulphite method	
CO4	Perform immobilization of enzymes and cells.	
CO5	Develop computational design for fermentative production of L- lysine	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	-	-	3
CO2	3	3	3	3	2	-	-	-	-	-	-	3
CO3	3	3	3	3	2	-	-	-	-	-	-	2
CO4	3	3	3	3	2	-	-	-	-	-	-	2
CO5	3	3	3	3	3	-	-	-	-	-	-	3
Avg	**3**	**3**	**3**	**3**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**2.6**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2
CO2	3	3	2	2
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	3	2	3
Avg	**3**	**2.4**	**2**	**1.8**

Sub Code	**RBT-652**
Sub. Name	**Plant Biotechnology Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to operate and handle the plant biotechnology lab equipments**.**	
CO2	The student should be able to perform tissue culture media preparation, sterilization and explants selection.	
CO3	The student should be able to understand in vitro cultures through axillary bud induction	
CO4	The student should be able to analyze plant secondary metabolites from selected medicinal plants.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	2	2	1	1	-	3	2	1	1
CO2	2	3	3	2	1	1	-	-	-	-	-	1
CO3	2	2	3	1	2	1	1	-	-	-	-	1
CO4	2	2	3	3	3	1	-	-	-	-	-	1
Avg	**1.75**	**2.25**	**3.00**	**2.00**	**2.00**	**1.00**	**1.00**	**-**	**3.00**	**2.00**	**1.00**	**1.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1
CO2	2	1	2	1
CO3	2	2	3	1
CO4	2	2	2	1
Avg	**2.00**	**1.75**	**2.25**	**1.00**

Sub Code	**RBT-653**
Sub. Name	**Bioinformatics-II Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand the basic software and tools used in structure prediction of biomolecules	
CO2	Conduct experimental procedure for Ramachandran plot and its analysis	
CO3	Construct and analyse of restriction maps, QSAR model and homology model	
CO4	Identify and structurally modify a natural product, to design a compound with the desired properties and to assess its therapeutic effects, theoretically.	
CO5	Enhance their practical knowledge and thus their employability	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	-	-	-	-	-	-	1
CO2	3	3	3	3	3	-	-	-	-	-	-	1
CO3	3	3	3	3	3	1	1	1	-	-	-	1
CO4	3	3	3	3	3	3	1	1	-	-	-	1
CO5	3	3	3	2	3	1	1	-	-	-	-	1
Avg	**3.00**	**3.00**	**2.80**	**2.60**	**3.00**	**1.67**	**1.00**	**1.00**	**-**	**-**	**-**	**1.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	1	-	3
CO2	3	1	-	3
CO3	3	1	-	3
CO4	3	2	-	3
CO5	3	1	-	3
Avg	**3.00**	**1.20**	**-**	**3.00**

4th Year, 7th Semester

S. No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
						Test	Assig/Att.		
1		Open Elective Course-I	Other Department	3-0-0	70	20	10	100	3
2	RBT071-074	Departmental Elective-III	Core Department	3-0-0	70	20	10	100	3
3	RBT075-078	Departmental Elective-IV	Core Department	3-1-0	70	20	10	100	4
4	RBT701	Environmental Biotechnology	Core Department	3-0-0	70	20	10	100	3
5	RBT702	Bioseperation & Down Stream Processing	Core Department	3-1-0	70	20	10	100	4
6	RBT751	Environmental Biotechnology Lab	Core Departmen	0-0-2	50		50	100	1
7	RBT752	Bioseperation & Down Stream Processing Lab	Core Department	0-0-2	50		50	100	1
8	RBT753	Industrial Training	Core Department					100	2
9	RBT754	Project-I	Core Department					200	3
	Total							**1000**	**24**

Departmental Elective-III

RBT071: Genomics and Proteomics
RBT072: Quality Control & Regulatory Affairs
RBT073: Clinical Trials & Management
RBT074: Bioprocess Economics & Project Management

Departmental Elective-IV

RBT075: Biosafety, Bioethics, IPR & Patents
RBT076: Agriculture Biotechnology
RBT077: Biomaterials

IMS Engineering College, Ghaziabad

Sub Code	**ROE-074**
Sub. Name	**Understanding the human being Comprehensively Human Aspiration audits fulfilment**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to understand clarity about human aspirations, goal, activities and purpose of life.	
CO2	The student should be able to facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.	
CO3	The student should be able to develop the understanding of human tradition and its various components.	
CO4	The student should be able to understand relationship of every unit of nature and existence	
CO5	The student should be able to understand professional competence and its importance in his professional life	
CO6	The student should be able to understand the importance of family, society and nature and living accordingly in harmony	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	1	-	-	2	1	3	2	2	-	3
CO2	-	-	-	-	-	2	2	2	2	1	-	2
CO3	-	-	1	-	-	3	1	2	2	1	-	2
CO4	-	-	-	-	-	2	1	2	2	1	-	1
CO5	-	-	1	-	-	2	2	2	2	1	-	2
CO6	-	-	-	-	-	2	2	2	2	-	-	2
Avg	-	-	-	-	-	**2.17**	**1.50**	**2.17**	**2.00**	**1.20**	-	**2.00**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	1	2	1
CO2	-	1	2	-
CO3	-	1	1	1
CO4	-	1	2	1
CO5	-	1	1	1
CO6	-	1	1	1
Avg	-	**1.00**	**1.50**	**1.00**

IMS Engineering College, Ghaziabad

Sub Code	**RBT071**
Sub. Name	**Genomics and Proteomics**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to describe the basic structural organization of genome and various molecular biology based tools used for its analysis	
CO2	The student should be able to explain various DNA sequencing technologies, genome sequencing projects and recent advances of high throughput genomic sequencing	
CO3	The student should be able to discuss and use the bioinformatics resources for analysis and annotation of genomes	
CO4	The student should be able to describe and apply methods of proteome analysis	
CO5	The student should be able to explain pharmacogenetics and its role in drug development	
CO6	The student should be able to elaborate the role of functional genomics and proteomics and techniques used to investigate protein structure and function	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	-	-	-	3	3	2	3
CO2	3	3	1	2	2	-	-	-	3	3	2	3
CO3	3	3	2	2	2	-	-	-	3	3	2	3
CO4	3	3	2	2	2	-	-	-	3	3	2	3
CO5	3	3	2	2	2	-	-	1	3	3	2	3
CO6	3	3	2	2	2	-	-	-	3	3	2	3
Avg	**3.00**	**2.83**	**1.67**	**2.00**	**2.00**	**#DIV/0!**	**#DIV/0!**	**1.00**	**3.00**	**3.00**	**2.00**	**3.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	3
CO4	3	3	3	2
CO5	3	3	3	2
CO6	3	3	3	2
Avg	**3.00**	**3.00**	**3.00**	**2.17**

IMS Engineering College, Ghaziabad

Sub Code	**RBT-075**
Sub. Name	**Biosafety, Bioethics and IPR**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to describe various forms of IPR and method of their registration	
CO2	The student should be able to state Indian Patent Law and International conventions and treaties	
CO3	The student should be able to debate legal, socio-economic and ethical issues of biotechnology	
CO4	The student should be able to apply rules governing manufacture, use/import/export and storage of hazardous microorganisms/ genetically engineered organisms or cells	
CO5	The student should be able to demonstrate biosafety issues and practices in biotechnology	
CO6	The student should be able to develop good lab practices, risk assessment and management	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	2	3	1	-	3	2	3	1	2
CO2	1	2	1	3	1	3	2	1	3	3	1	3
CO3	2	2	1	-	3	2	2	3	3	3	1	2
CO4	3	3	-	2	-	-	2	3	3	3	2	2
CO5	2	3	2	1	-	1	1	3	2	3	3	2
CO6	3	3	2	2	2	-	-	2	3	3	2	2
Avg	**2.00**	**2.50**	**1.40**	**2.00**	**2.25**	**1.75**	**1.75**	**2.50**	**2.67**	**3.00**	**1.67**	**2.17**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	3
CO2	2	3	3	1
CO3	1	3	2	3
CO4	3	3	1	2
CO5	2	1	1	2
CO6	2	3	2	3
Avg	**2.00**	**2.33**	**1.67**	**2.33**

Sub Code	**RBT-701**
Sub. Name	**Environmental Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to analyze reasons behind various forms of environmental pollutions and provide solutions to minimize or mitigate them.	
CO2	The student should be able to explain the microbial processes and growth requirements underlying the aerobic and anaerobic digestion.	
CO3	The student should be able to discuss the importance of microbial diversity in environmental systems and their exploitation in building waste water treatment systems.	
CO4	The student should be able to describe biotechnological solutions to convert waste into utilizable products.	
CO5	The student should be able to evaluate the potential for biodegradation of organic pollutants, taking microbial and physical/chemical environments, as well as the chemical structure of the compound itself, into consideration	
CO6	The student should be able to discuss the minimal national standards for waste disposal and the social, economic and environmental aspects of waste management.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	2	3	3	-	2	2	3	3
CO2	2	1	-	2	-	-	-	-	-	-	1	3
CO3	3	3	3	3	3	3	3	-	3	3	3	3
CO4	3	3	3	3	3	3	3	-	2	2	2	3
CO5	3	3	-	2	-	1	1	-	-	1	1	3
CO6	2	1	-	-	-	3	3	3	3	3	-	3
Avg	**2.50**	**2.33**	**3.00**	**2.60**	**2.67**	**2.60**	**2.60**	**3.00**	**2.50**	**2.20**	**2.00**	**3.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	1	3	1	-
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	1	1
CO6	2	3	3	-
Avg	**2.50**	**2.83**	**2.33**	**2.50**

IMS Engineering College, Ghaziabad

Sub Code	**RBT 702**
Sub. Name	**Bioseperation & Down Stream Processing**

COURSE OUTCOMES		**Bloom's Level**
CO1	Students should be able to evaluate the fundamentals of downstream processing for biochemical product recovery, process economics, process synthesis and simulation.	
CO2	Students should be able to apply different techniques used in cell disruption and removal of insolubles in DSP.	
CO3	Students should be able to use different techniques for product isolation or recovery.	
CO4	Students should be able to understand the principles, working and applications of different purification techniques used in DSP.	
CO5	Students should be able to use different product polissing techniques like dying and crystallization.	
CO6	Students should be able to apply different techniques for the DSP of some primary and secondary products.	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	2	2	2	-	-	1	-	1	2
CO2	2	2	3	2	2	2	-	-	1	-	1	2
CO3	2	2	3	2	2	2	-	-	1	-	1	2
CO4	3	2	2	2	3	2	-	-	1	-	1	2
CO5	3	3	2	-	3	2	-	-	1	-	1	2
CO6	3	2	2	2	3	2	-	-	1	-	2	2
Avg	**2.50**	**2.17**	**2.33**	**2.00**	**2.50**	**2.00**	**#DIV/0!**	**#DIV/0!**	**1.00**	**#DIV/0!**	**1.17**	**2.00**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	3	1	-
CO2	3	2	2	-
CO3	2	2	2	-
CO4	2	2	2	1
CO5	2	2	2	1
CO6	-	2	2	-
Avg	**2.20**	**2.17**	**1.83**	**1.00**

IMS Engineering College, Ghaziabad

Sub Code	**RBT 751**
Sub. Name	**Environmental Biotechnology Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to describe the working of equipments used in environmental biotechnology lab.	
CO2	The student should be able to perform statistical analysis in the water quality testing	
CO3	The student should be able to prepare various solutions and chemical reagents.	
CO4	The student should be able to perform experiment to evaluate various parameters that affect the water quality	
CO5	The student should be able to apply general chemical techniques to evaluate microbial contamination of water	
CO6	The student should be able to apply general microbiological techniques to evaluate microbial contaminant in water	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	1	2	-	-	-	3	1	1	3
CO2	2	2	2	2	2	1	3	-	3	1	1	3
CO3	-	-	-	1	-	-	-	-	3	-	-	3
CO4	2	2	2	3	2	1	3	-	3	1	1	3
CO5	2	2	2	3	2	1	3	-	3	1	1	3
CO6	2	2	2	3	2	1	3	-	3	1	1	3
Avg	**2.00**	**2.00**	**2.00**	**2.17**	**2.00**	**1.00**	**3.00**	**#DIV/0!**	**3.00**	**1.00**	**1.00**	**3.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	1	-	3	-
CO2	3	1	3	-
CO3	1	-	-	-
CO4	3	1	3	3
CO5	3	1	3	3
CO6	3	1	3	3
Avg	**2.33**	**1.00**	**3.00**	**3.00**

Sub Code	**RBT 752**
Sub. Name	**Bioseperation & Down Stream Processing Lab**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to use various techniques for harvesting and disruption of the microbial cells.	
CO2	The student should be able to use different techniques for Product isolation.	
CO3	The student should be able to purification Protein by precipitation and solvent extraction methods.	
CO4	The student should be able to use separate techniques like chromatography & electrophoresis.	
CO5	The student should be able to estimate the protein, DNA and carbohydrates.	
CO6	The student should be able to use various techniques for packaging and labelling of recombinant biopharmaceutical products.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**2**	**3**	**-**	**2**	**2**	**1**	**-**	**1**	**-**	**2**	**3**
CO2	**1**	**2**	**3**	**1**	**2**	**2**	**1**	**-**	**1**	**-**	**2**	**3**
CO3	**1**	**2**	**3**	**1**	**2**	**2**	**-**	**-**	**1**	**-**	**2**	**3**
CO4	**1**	**2**	**3**	**1**	**2**	**2**	**-**	**-**	**1**	**-**	**2**	**3**
CO5	**1**	**2**	**3**	**1**	**2**	**2**	**-**	**-**	**1**	**-**	**2**	**3**
CO6	**1**	**2**	**3**	**-**	**2**	**2**	**1**	**-**	**1**	**-**	**2**	**3**
Avg	**1.00**	**2.00**	**3.00**	**1.00**	**2.00**	**2.00**	**1.00**	**-**	**1.00**	**-**	**2.00**	**3.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1
CO2	3	1	1	1
CO3	2	1	1	1
CO4	2	1	1	2
CO5	2	1	1	2
CO6	1	2	1	1
Avg	**2.00**	**1.33**	**1.00**	**1.33**

4th Year, 8th Semester

S. No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
						Test	Assig. /Att.		
1		Open Elective Course-II	Other Department	3-0-0	70	20	10	100	3
2	RBT081-84	Departmental Elective-V	Core Department	3-1-0	70	20	10	100	4
3	RBT085-088	Departmental Elective-VI	Core Department	3-0-0	70	20	10	100	3
4	RBT851	Seminar	Core Department	0-0-3			100	100	2
5	RBT852	Project-II	Core Department	0-0-12	350		250	600	12
	Total							**1000**	**24**

Departmental Elective-V

RBT081: Experimental Biotechnology (NPTEL)
RBT082: Tissue Engineering (NPTEL)
RBT083: Introductory mathematical models for biologists (NPTEL)
RBT084: Database Design (NPTEL)

Departmental Elective-VI

RBT085: Biostatistics & design of experiments (NPTEL)
RBT086: Integrated waste management for smart cities (NPTEL)
RBT087: Industrial Biotechnology (NPTEL)
RBT088: Computer aided drug design (NPTEL)

IMS Engineering College, Ghaziabad

Sub Code	**ROE-082**
Sub. Name	**Entrepreneurship Development**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to identify and analyze the opportunities for entrepreneurship and innovation in various sectors.	
CO2	The student should be able to apply the principles of Project management including the idea generation, project identification, project formulation, project design and network analysis, project report, project appraisal.	
CO3	The student should be able to evaluate and analyse the financials of a business or enterprise.	
CO4	The student should be able to describe the funding opportunities and other financial alternatives available for business.	
CO5	The student should be able to explain the steps for setting up Small, Medium & Large scale industry.	
CO6	The student should be able to describe the incentives, subsidies and export possibilities available for biotech business.	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2	1	2	3	1	-	3	2	3	1	2
CO2	1	2	1	3	1	3	2	1	3	3	1	3
CO3	2	2	1	-	3	2	2	3	3	3	1	2
CO4	3	3	-	2	-	-	2	3	3	3	2	2
CO5	2	3	2	1	-	1	1	3	2	3	3	2
CO6	3	3	2	2	2	-	-	2	3	3	2	2
Avg	**2.00**	**2.50**	**1.40**	**2.00**	**2.25**	**1.75**	**1.75**	**2.50**	**2.67**	**3.00**	**1.67**	**2.17**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	1	3
CO2	2	3	3	1
CO3	1	3	2	3
CO4	3	3	1	2
CO5	2	1	1	2
CO6	2	3	2	3
Avg	**2.00**	**2.33**	**1.67**	**2.33**

IMS Engineering College, Ghaziabad

Sub Code	**ROE-086**
Sub. Name	**Renewable Energy Resources**

COURSE OUTCOMES		**Bloom's Level**
CO1	Understand about various sources of non-conventional energy, their benefits and constraints	
CO2	Understand the principles of energy conversion and electricity production	
CO3	Learn about construction , performance , economy and widespread feasibility of power plants based on non-conventional resources	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	1	1	2	2	3	1	-	1	-	1
CO2	2	3	1	2	1	2	1	-	-	1	2	2
CO3	3	1	2	3	-	-	3	1	2	2	3	2
Avg	**2.0**	**2.3**	**1.33**	**2.0**	**1.0**	**1.33**	**2.3**	**0.66**	**0.66**	**1.33**	**1.66**	**1.66**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1	1	1
CO2	3	2	-	3
CO3	2	1	1	3
Avg	**2.66**	**1.33**	**0.66**	**2.33**

IMS Engineering College, Ghaziabad

Sub Code	**RBT-081**
Sub. Name	**Experimental Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to understand the basic concepts of Spectroscopy like UV-Vis, Fluorescence, CD, and IR spectroscopy	
CO2	The student should be able to understand the experimental protocols for the estimation of Proteins and DNA	
CO3	The student should be able to understand the mathematical concepts of buffer and experimental approach of Electrophoresis	
CO4	The student should be able to understand the basics of chromatographic techniques, their principles and operating procedure	
CO5	The student should be able to understand the basic concepts and experimental approach of immunological assays	
CO6	the student should be able to understand the basic concepts of microscopic techniques and molecular cloning	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	1
CO2	3	3	3	2	2	2	-	-	-	-	-	1
CO3	3	3	2	2	2	-	-	-	-	-	-	1
CO4	3	2	2	2	3	2	-	-	-	-	-	1
CO5	3	3	3	3	3	-	-	-	1	-	1	1
CO6	3	2	2	3	2	2	-	-	1	-	1	1
Avg	**3.00**	**2.67**	**2.50**	**2.50**	**2.50**	**2.00**	**-**	**-**	**1.00**	**-**	**1.00**	**1.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	2
CO2	3	2	1	2
CO3	3	2	1	2
CO4	3	1	2	-
CO5	3	2	1	1
CO6	3	1	1	-
Avg	**3.00**	**1.67**	**1.20**	**1.75**

IMS Engineering College, Ghaziabad

Sub Code	**RBT-086**
Sub. Name	**Integrated Waste Management for Smart Cities**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to outline sources, types and composition of Municipal solid waste (MSW).	
CO2	The student should be able to explain Swachh Bharat Mission, Smart Cities Program and the issues and legislation related to MSW management	
CO3	The student should be able to describe the appropriate method for solid waste collection, transportation, Segregation and processing.	
CO4	The student should be able to describe the disposal treatments of solid waste and energy generation from it.	
CO5	The student should be able to explain construction and demolition waste sources, types and its management	
CO6	The student should be able to explain E-waste management and its legislation guidelines	

CO-PO Matrix

Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	3	3	2	3	3	-	2	2	3	3
CO2	2	1	-	2	-	-	-	-	-	-	1	3
CO3	3	3	3	3	3	3	3	-	2	2	2	3
CO4	3	3	3	3	3	3	3	-	2	2	2	3
CO5	3	3	-	2	-	1	1	-	-	1	1	3
CO6	3	3	3	3	3	3	3	-	2	2	2	3
Avg	**2.67**	**2.67**	**3.00**	**2.67**	**2.75**	**2.60**	**2.60**	**-**	**2.00**	**1.80**	**1.83**	**3.00**

CO-PSO Matrix

COs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3
CO2	1	3	1	-
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	1	1
CO6	3	3	3	3
Avg	**2.67**	**2.83**	**2.33**	**2.60**

Sub Code	**RBT087**
Sub. Name	**Industrial Biotechnology**

COURSE OUTCOMES		**Bloom's Level**
CO1	The student should be able to evaluate the various concepts of engineering calculation and Data analysis.	
CO2	The student should be able to use different types of reactors and their operation control.	
CO3	The student should be able to apply various information for the designing of a bioreactor.	
CO4	The student should be able to evaluate the various concepts of reactor engineering and kinetics of single and multiple reactor system.	
CO5	The student should be able to use different production technologies for the production of cell mass and some primary metabolites.	
CO6	The student should be able to use different applications of bioconversion like transformation of sterols and non-steroidal compounds.	

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	1	1	-	1	-	1	3
CO2	3	3	3	3	3	1	1	-	1	-	1	3
CO3	3	3	3	3	3	1	1	-	1	-	1	3
CO4	3	3	3	3	3	1	1	-	1	-	1	3
CO5	2	2	2	1	1	2	2	2	1	-	1	3
CO6	2	2	2	1	1	2	2	-	1	-	1	3
Avg	**2.67**	**2.67**	**2.50**	**2.33**	**2.33**	**1.33**	**1.33**	**2.00**	**1.00**	**-**	**1.00**	**3.00**

CO-PSO Matrix

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1
CO2	2	2	2	2
CO3	2	2	1	1
CO4	2	2	1	2
CO5	2	2	2	1
CO6	2	2	1	1
Avg	**2.17**	**1.83**	**1.33**	**1.33**