MGM UNIVERSITY, AURANGABAD

INSTITUTE of BIOSCIENCES AND TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

CURRICULUM

w. e. f. Academic Year 2021-22

Faculty of Engineering and Technology

Graduate (UG) Program

B.Tech. (UG)

B.TECH. BIOTECHNOLOGY- CURRICULUM

SEMESTER-I-VIII

	Semester I																	
Course code *	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 111	Basic Cell Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 112	Microbial Physiology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 113	General Biochemistry	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 114	Biology Concept, Connection, Innovation And Application	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-115	Academic Tutorial- I	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-116	Microbiology Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-117	Biochemistry Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-118	Micro Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
GS-1	Gandhian Studies	Theory	2	-	-	10	10		30	-	50	-	-	-	12	-	20	Audit
UNC -02	Universal Human Values	Theory	1	-		10	10		30	-	50	-	-	-	12		20	Audit
BTB-119	English Communication Essentials	Theory	2	-	-	10	10		30	-	50	-	-	-	12	-	20	Audit
	Total		**20**	**5**	**6**	**130**	**130**	**60**	**390**	**90**	**800**	**0**	**0**	**24**	**156**	**36**	**320**	**23**

Semester II																			
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 121	Numerical And Computational Fundamentals-I	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 122	Enzymology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 123	Molecular Biology of Gene	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 124	Basic Immunology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-125	Mendel And Darwin Theory	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-126	Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-127	Immuno Enzymo Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-128	Micro Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
	Communication skills	Theory	2	-	-	10	10		30	-	50	-	-	-	12	-	20	Audit
	Total		**17**	**5**	**6**	**110**	**110**	**60**	**330**	**90**	**700**	**0**	**0**	**24**	**132**	**36**	**280**	**23**

Semester III																			
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 231	Numerical And Computational Fundamentals-II	Theory	2	1	-	20	20	-	60	-	100	-	-	-	24	-	40	3
BTB 232	Genetics And Evolution	Theory	2	1	-	20	20	-	60	-	100	-	-	-	24	-	40	3
BTB 233	Chemistry of Biomolecules	Theory	2	1	-	20	20	-	60	-	100	-	-	-	24	-	40	3
BTB 234	Microbe infection And Immunity	Theory	3	1	-	20	20	-	60	-	100	-	-	-	24	-	40	4
BTB 235	Instrumentation In Biotechnology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-237	Seminar (Subject Base Seminar)	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-238	Bio-Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-239	Genetics Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-230	Mini Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
UNC-01	Environmental Studies	Theory	2	-	-	10	10	-	30	-	50	-	-	-	12	-	20	Audit
	Total		**16**	**5**	**8**	**100**	**120**	**80**	**330**	**120**		**8**	**16**	**32**	**132**	**48**	**300**	**21**

Semester IV																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 241	Numerical And Computational Fundamentals-III	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 242	Genomics And Proteomics	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 243	Introduction to Fermentation Technology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 244	Principles of Developmental Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 245	Recombinant DNA Technology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-247	Seminar (Subject Base Seminar)	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-248	Bio-Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-249	Indus Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-240	Mini Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BTB 246	Open Elective	Theory	2	-	-	10	10	-	30	-	50	-	-	-	12	-	20	Audit
	Total		**15**	**5**	**8**	**100**	**100**	**80**	**300**	**120**	**750**	**0**	**0**	**32**	**120**	**48**	**280**	**24**

Semester V																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 351	Numerical And Computational Fundamentals-IV	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 352	Plant Tissue Engineering	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 353	Cell Signalling	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 354	Stem Cell Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-356	Seminar (Subject Base Seminar)	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-357	Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-358	Plant Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-359	Mini Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BTB-350	Foregin Language	Theory	2	-	-	10	10	-	30	-	50	-	-	-	12	-	20	2
	Total		**14**	**4**	**8**	**90**	**90**	**80**	**270**	**120**	**650**	**0**	**0**	**32**	**108**	**48**	**260**	**22**

Semester VI																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 361	Python	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 362	Animal Tissue Engineering	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 363	Molecular Cytogenetics	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 364	Cancer Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-365	Python Lab.	Practical			4			20	-	30	50	-	-	8		12	20	2
BBL-366	Animal Tissue Lab	Practical			4			20	-	30	50	-	-	8		12	20	2
BBL-367	Elective- 1-Pharmaceutical Microbiology 2- Enterprise Feasibility 3-Bioinformatics	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-368	Mini Project	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-369	Seminar (Research Paper Based)	Practical			2			20	-	30	50	-	-	8		12	20	1
	Total		**12**	**4**	**14**	**80**	**80**	**100**	**240**	**150**	**650**	**0**	**0**	**40**	**96**	**60**	**260**	**23**

Semester VII																			
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 471	Molecular Pharming And Biopharmaceuticals	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 472	R language	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 473	Gene, Marker And Omics Technology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-474	Biopharmaceutical Lab.	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-475	R Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-476	Elective - 1- Biotechnology- Paper 2- Advanced Technology Enterprise 3- Writing And Referencing Skills	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-477	Core Project	Practical	-	-	14	-		80		120	200	-	-	32		48	80	7
BBL-478	Seminar (Research Paper Based)	Practical			2			20	-	30	50	-	-	8		12	20	1
	Total		**9**	**3**	**22**	**60**	**60**	**160**	**180**	**240**	**700**	**0**	**0**	**64**	**72**	**96**	**280**	**23**

Semester VIII																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB-481	Advanced Topics in Molecular Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-482	Post Genomic Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-483	Big Idea	Practical	-	-	20	-	-	80	-	120	200	-	-	32	-	48	80	10
BBL-484	Seminar (Research Paper Based)	Practical	-	-	2			20	30	-	50	-	-	8		12	20	1
	Total		**6**	**2**	**22**	**40**	**40**	**100**	**150**	**120**	**450**	**0**	**0**	**40**	**48**	**60**	**180**	**19**

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, MSE- Mid Semester Examination, ESE- End Semester Examination, PR-Practical, TW-Term Work BTB- B. Tech. Biotechnology, OEC- Open Elective Courses, UGL-Undergraduate Laboratory, UNC- Undergraduate Non credit

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CURRICULUM

Faculty of Engineering and Technology

Graduate (UG) Program

B.Tech. (UG)

B.TECH. BIOTECHNOLOGY- CURRICULUM

FIRST YEAR

SEMESTER-I

Detail Course Layout with course content

1st Year I Semester

BTB-111	Basic Cell Biology	4+0
BTB-112	Microbial Physiology	4+0
BTB-113	General Biochemistry	4+0
BTB-114	Biology Concept, Connection, Innovation And Application	4+0
BBL-115	Academic Tutorial- I	4+0
BBL-116	Microbiology Lab	0+1
BBL-117	Biochemistry Lab	0+1
BBL-118	Micro Project-	0+1
GS-1	Gandhian Studies	Audit
UNC-02	Universal Human Values	Audit
BTB-119	English Communication Essentials	Audit

	Semester I																		
Course code *	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 111	Basic Cell Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 112	Microbial Physiology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 113	General Biochemistry	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 114	Biology Concept, Connection, Innovation And Application	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-115	Academic Tutorial- I	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-116	Microbiology Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-117	Biochemistry Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-118	Micro Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
GS-1	Gandhian Studies	Theory	2	-	-	10	10		30	-	50	-	-	-	12	-	20	Audit
UNC -02	Universal Human Values	Theory	1	-		10	10		30	-	50	-	-	-	12		20	Audit
BTB-119	English Communication Essentials	Theory	2	-	-	10	10		30	-	50	-	-	-	12	-	20	Audit
	Total		**20**	**5**	**6**	**130**	**130**	**60**	**390**	**90**	**800**	**0**	**0**	**24**	**156**	**36**	**320**	**23**

BASIC CELL BIOLOGY

University: MGM University, Aurangabad

Faculty: Engineering and Technology

Institute: Institute of Biosciences and Technology.

Degree: B.Tech. Biotechnology

Course Unit Code: BTB- 111

Course Title: Basic cell biology

Credits allocated: 4+0

Level of Study: UG

Recommended Year /Semester: B.Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the principal. The approved courses must be mentioned in the roster form.

Learning Outcomes:

Upon successful completion, students will have the knowledge and skills to:

1.Describe the evolution, diversity and replication of cells

2.Explain the role of compartmentalization and signalling in cellular biology

3.Interpret and explain key experiments in the history of cell biology

4.Evaluate and apply knowledge of modern techniques in cellular biology

5.Interpret, analyse, describe and present new experimental data

Objective:

1.Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles

2. Students will understand how these cellular components are used to generate and utilize energy in cells

3. Students will understand the cellular components underlying mitotic cell division.

4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

COURSE CONTENT

THEORY

Unit I: Cells and Genome

Introduction to cell: Cells and Genome: The Universal features of cells on Earth, Genetic Information in Eukaryotes

The chemical component of a cell Proteins: The Shape and Structure of Proteins. Protein Function.

Unit II: Internal Organization of the cell:

Membrane Structure: The Lipid Bilayer, Membrane proteins, Membrane transport of small molecules and the electrical properties of membranes: Principles of membrane transport, Transporters and active membrane transport, Channels and the electrical properties of membranes.

Unit III: Ways of Working with Cells

Analysing cells, molecules, and systems: Isolation cells and

Growing them in culture, Purifying Proteins, Analysing Proteins, Analysing and

Manipulating DNA. Electron Microscope, Compound Microscope.

Unit IV: Cell Signalling

The Principals of Cell Signalling, signalling through G- protein- Coupled

Receptors. The Cell Cycle, Cell Death, Cell Junction and the Extracellular Matrix

Unit V: Pathogens and Infection

The Innate and Adaptive Immune Systems. Antigens, Antibody, Antigen-Antibody interaction, ELISA.

Reference Book/ suggested Reading/ Textbook:

1. Molecular Biology of the Cell (6th Edition) ...
2. The Cell: A Molecular Approach (7th Edition) ...
3. Essential Cell Biology (4th Edition) ...
4. Mitochondria and the Future of Medicine (1st Edition) ...
5. The Double Helix (1st Edition) ...
6. The Epigenetics Revolution (1st Edition)

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Microbial Physiology

University: MGM University, Aurangabad

Faculty: Engineering and Technology

Institute: Institute of Biosciences and Technology.

Degree: B.Tech. Biotechnology

Course Code: BTB- 112

Course Title: Microbial Physiology

Credits allocated: 4+0

Level of Study: UG

Recommended Year /Semester: B.Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the principal. The approved courses must be mentioned in the roster form

Learning Outcomes:

After completion of the lecture component of the course, successful students will:

1. Demonstrate an understanding of cellular superstructure and the functional components of cells.

2. Demonstrate an understanding of how organisms build and maintain a proton motive force.

3. Comprehend the how cells metabolize the nutrients necessary for life including carbon, nitrogen, sulphur and phosphorus.

4. Appreciate how biochemical pathways and processes are integrated into a network, which provides robustness to life.

5. Comprehend how cellular physiology is altered by interactions between microbes and the environment. 6. Appreciate that the diversity of life is driven by the metabolic diversity of microbes.

Objective:

Students are expected to gain a fundamental understanding of the organization and metabolism of microbial cells to further comprehend the robust and diverse nature of life.

COURSE CONTENTS

THEORY

Unit I: Microbial Growth

Definition of growth, balanced and unbalanced growth, growth curve, the mathematics of growth-generation time, specific growth rate, batch and continuous culture, Synchronous growth, diauxic growth curve. pH-classification based on pH ranges and adaptations

Unit II: Microbial Transport and Metabolism

Diffusion – Passive and facilitated, Primary active and secondary active transport, Group translocation (phosphotransferase system), symport, antiport and uniport, electrogenic and electro neutral transport. Chemolithotrophic metabolism- Carbondioxide fixation: Calvin cycle and reductive TCA cycle. physiology of bacterial photosynthesis: light reactions, cyclic and non-cyclic photophosphorylation.

Unit III: Enzymes and Regulation

Enzymes: Importance, structure and classification of enzymes. Apoenzyme and cofactors. Prosthetic group, coenzyme and metal cofactors. Active site and its salient features. Mechanism of enzyme action. Activation energy, Lock and key hypothesis, induced fit. Enzyme kinetics and inhibition, Effect of pH and temperature on enzyme activity. rreversible and reversible inhibition: competitive and non-competitive inhibition. Activity: allostery, covalent modification and feedback inhibition.

Unit IV: Microbial energetics and Nitrogen Fixation

Concept of aerobic respiration, anaerobic respiration and fermentation. Central metabolic pathways: EMP pathway, ED pathway, PP pathway, and TCA cycle. Gluconeogenesis. Nitrogen Fixation – Physiology of nitrogen cycle. Assimilatory and dissimilatory nitrate reduction, biological nitrogen fixation. Nitrogen fixers and mechanism of nitrogen fixation.

Unit V: Microbial Respiration

Components of respiratory chain, and their inhibitors. Anaerobic respiration, denitrification, nitrate/nitrite respiration. Oxidative phosphorylation: ATP synthesis and ATP synthase. Uncouplers, Chemical coupling, conformational coupling

Reference Book/ suggested Reading/ Textbook:

1.Atlas RM. (1989). *Microbiology: Fundamentals and Applications*. 2nd Edition,MacMillan Publishing Company, New York.

2. Conn EE and Stumpf PK. (1976). *Outlines of Biochemistry*. John Wiley & Sons.

3. Gallon JR and Chaplin AE. (1987). *An Introduction to Nitrogen Fixation*. CassellEducation Ltd.

4. Gottschalk G. (1986). *Bacterial Metabolism*. 2nd edition. Springer Verlag.

5. Lehninger A. (1982). *Biochemistry*. Worth Publ.

6. Moat AG and Foster JW. (2002). *Microbial Physiology*. John Wiley and Sons

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

<table>
<tr><td colspan="4">Theory Assessment (Marks distribution): 100</td></tr>
<tr><td rowspan="2">Internal Assessment</td><td rowspan="2">MSE (Unit test)</td><td colspan="2">CA</td><td rowspan="2">Total Marks</td></tr>
<tr><td>Attendance record</td><td>Home Assignment</td></tr>
</table>

	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
	75-80	7-8
	80-90	8-9
	90-100	9-10

General Biochemistry

University: MGM University, Aurangabad

Faculty: Engineering and Technology

Institute: Institute of Biosciences and Technology.

Degree: B.Tech. Biotechnology

Course Code: BTB- 113

Course Title: General Biochemistry

Credits allocated: 4+0

Level of Study: UG

Recommended Year /Semester: B.Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Learning Outcomes:

1.The learning outcomes are designed to help learners understand the objectives of studying Biochemistry that is, to analyse, appreciate, understand the basic concepts of chemical reactions that occur in living systems

2. The student will be able to identify the structural elements of proteins, the basic features of enzyme catalysis and regulation, and the function of hemoglobin in oxygen binding and transport.

3.The student will be able to describe the basic structural features of nucleic acids.

Objective:

1. The student will have an understanding of the metabolic processes by which energy is produced in cells and amino acids, lipids, purines and pyrimidines, and carbohydrates are synthesized.
2. The student will be able to describe the roles of vitamins in metabolic processes and enzyme activity.

COURSE CONTENTS

THEORY

Unit I: Introduction: Biochemistry & it's scope

Cellular Biochemistry - Cell-structure – plant and animal, composition and function of cell organelle Carbohydrates: Occurrence, Classification & Structures; Physicochemical and Metabolic functions.

Unit II: Biological role of carbohydrates

Metabolism of carbohydrates - glycolysis and respiration, production of ATP, brief description of electron transport chain, oxidative and substrate phosphorylation Proteins: Occurrence, Classification & Structures; Physicochemical & Metabolic functions.

Unit III: Metabolism of proteins

Breakdown of proteins, transamination, deamination, decarboxylation, nitrogen fixation, urea cycle; Lipids: Occurrence, Classification & Structure; Physicochemical and metabolic functions.

Unit IV: Biological Role of Lipid

classification and biosynthesis; Biological role of lipids; breakdown of triglycerides and phospholipids; β-oxidation of long chain fatty acids, ketosis, biosynthesis of fatty acids, triglycerides and phospholipids.

Unit V: Nucleic Acids

Classification, structure & biosynthesis of nucleic acid; Metabolism RNA and DNA metabolism. Vitamins; Sources and classification, Chemistry and Metabolic functions, deficiency syndromes, Minerals; Sources and classification, Chemistry and Metabolic functions, deficiency syndromes.

TEXT BOOK

1. Fundamentals of Biochemistry Jain JL, Jain S and Jain N S. Chand Publication, India 2016
2. Biochemistry Satyanarayana Elsevier, 2013
3. Lehninger Principles of Biochemistry David L. Nelson and Michael M. Cox 6th Ed. Macmillan Learning, NY, USA. 2012
4. Outlines of Biochemistry Conn EE and Stumpf PK 4 th Edition Wiley Eastern Ltd, Pune (India)

Reference Book/ suggested Reading/ Textbook:

1. Wardlaw's Perspectives in Nutrition: A Functional Approach Gaile Moe, Danita Kelley, Byrd-Bredbenner Jacqueline Berning and Carol Mc Graw-Hill, Inc., NY, USA. 2013
2. Biochemistry Carolyn D. Berdanier, Elaine B. Feldman and Johanna Dwyer 4th Ed. John Wiley and Sons, Inc.,NY, USA. 2011
3. Handbook of Nutrition and Food Donald Voet and Judith G. Voet 2nd Ed. CRC Press, Boca Raton,FL, USA. 2008
4. Biochemistry & Molecular Biology of Plants Bob B. Buchanan, Wilhelm Gruissem and Russell L. Jones John Wiley and Sons, Inc., NY, USA. 2002

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Biology Concept, Connection, Innovation and Application

University: MGM University, Aurangabad
Faculty: Engineering and Technology
Institute: Institute of Biosciences and Technology.
Degree: B.Tech. Biotechnology
Course Code: BTB- 114
Course Title: Biology Concept, Connection, Innovation and Application
Credits allocated: 4+0
Level of Study: UG
Recommended Year /Semester: B.Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the principal. The approved courses must be mentioned in the roster form

Learning Outcomes:

Specific skills and competencies expected of students who complete this course include:

1. Describe basic physicochemical concepts that underlie the structure and function of cells
2. Describe the structure and function of the four classes of biomolecules
3. Describe the structure and function of eukaryotic cells and their organelles
4. Describe the processes by which substances move into and out of cells
5. Describe the structure and function of enzymes
6. Discuss energy transfer in cells and the pathways of cellular respiration

7. Describe DNA replication, protein synthesis, mitosis and meiosis
8. Analyse, synthesize, evaluate and apply information
9. Apply mathematical, logical and scientific principles and methods
10. Demonstrating higher level critical thinking skills, solving problems, and following directions
11. Directing their own learning activities to meet course objectives

Objective:

1. to provide an introduction to basic biological concepts including the metric system, physical and chemical properties of life, cell structure and function, cell reproduction, and metabolism.
2. To unable student to do Critical thinking skills, study skills, and basic math skills are also included.

COURSE CONTENTS

THEORY

Unit I: The molecular basis of Life/ Cell

The science of biology, the scientific study of life, the nature of molecules and the properties of water, the chemical Building Block of life / chemistry of life, Cell structure and function, Membrane structure and function, Metabolism energy and enzymes, how cells harvest energy, Photosynthesis, Cell communication, how cell divide / cell division, Plant organization and function, Plant reproduction and responses, how cells release energy

Unit II: Genetics and Molecular biology

Sexual Reproduction and Meiosis, Patterns of inheritance, Human inheritance, Chromosome, mapping and the Meiosis-inheritance connection, DNA-The genetic material, Genes and how they work, DNA Replication, Binary fission and Mitosis, Control of gene expression, DNA Technology, Genomics, Cellular Mechanisms of development

Unit III: Cells and Energy

Cells: The working Units of Life, Features of Prokaryotic and Eukaryotic cell, chemical structure and functions of lipids, Cell Membranes, Cell communication and multicellularity, Signal transduction pathway, Signal Receptors initiate a cellular response,

Energy: types of energy, types of metabolism, Laws of thermodynamics, Role of ATP in biochemical energetics,

Enzymes: Introduction, Working of enzymes, Regulation of enzymes

Unit IV: Genes and Heredity

The cell cycle and cell division, Inheritance, Genes and chromosomes, DNA and Its Role in Heredity, From DNA to Protein: Gene Expression, Gene Mutation and Molecular Medicine, Regulation of Gene Expression.

Unit V: Genomes

Genomes, Recombinant DNA and B.Tech. Biotechnology, Differential gene Expression in Development, Genes its development and Evolution

Reference Book/ suggested Reading/ Textbook:

1. Biology -Concepts & Applications by Cecie Starr Christine A. Evers Lisa Starr
2. BIOLOGY- Concept and investigation by MariëlleHoefnagels
3. Campbell Biology: Concepts & Connections by Martha R. Taylor, Eric J. Simon, Jean L. Dickey, Kelly A. Hogan, Jane B. Reece
4. Life: The Science of Biology by David E. Sadava , David M. Hillis, et al.
5. Biology by Peter Raven, George Johnson, Kenneth Mason, Jonathan Losos , Susan Singer

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100

Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8

2.	80-90	8-9
3.	90-100	9-10

ACADEMICS TUTORIAL

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B.Tech. Biotechnology

Course Code: BBL- 115 **Course Title:** Academics Tutorial

Credits allocated: 4+0 **Level of Study:** UG

Recommended Year /Semester: B.Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective: The aim of this course is to provide assignments to students of allotted topic, to have discussion forum by creating groups and allotting them different topics for discussion, oral quiz competition etc.

Learning Outcomes:

After the course, the student will be able to understand the topic in detail and develop confidence.

COURSE CONTENTS

THEORY

1) Assignments
2) Discussion forum

3) Oral quiz competition
4) Tests

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Microbiology Lab

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Tech. **Degree:** B.Tech. Biotechnology

Course Code: BBL-116 **Course Title:** Microbiology Lab

Credits allocated: 0+1 (1 Practical) **Level of Study:** UG

Mode of delivery, planned learning activities and teaching method: Practical 3 hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester I

Detail syllabus

1. To study laboratory rules
2. To study compound microscope
3. To study autoclave
4. To Study Hot air oven
5. To study lab equipment
6. To study centrifuge
7. To study laminar air flow
8. To study water bath
9. To study incubator shaker

10. To study spectrophotometer
11. To prepare bacterial culture media
12. To study streak plate and
13. To spread plate method
14. To study pour plate method
15. Simple staining
16. Negative staining
17. Gram staining.
18. Lactophenol Cotton Blue staining for fungi.
19. To study the preparation of Potato Dextrose Agar for cultivation of fungi.
20. To study storage of microorganinsm.
21. To study the growth curve of *E.coli*
22. To perform IMViC test

Practical Assessment

Components (TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.
- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge
- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks

1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

BIOCHEMISTRY LAB

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Tech. **Degree:** B.Tech. Biotechnology

Course Code: BBL-117 **Course Title:** Biochemistry Lab

Credits allocated: 0+1 (1Practical) **Level of Study:** UG

Total Hours: 3 hrs

Mode of delivery, planned learning activities and teaching method: Practical 3 hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester I

Detail syllabus

1. Qualitative analysis of carbohydrates (Glucose, Fructose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Preparation of buffer solution and measurement of pH.
5. Study of enzymatic hydrolysis of Starch.

6. Determination of Salivary Amylase activity.
7. Amino acids and protein qualitative tests
8. Estimation of proteins by Lowry's method
9. Lipids Qualitative test
10. Separation of amino acids by TLC
11. To study the Fehling and Benedict test for carbohydrates
12. To study Sumner's Method for reducing sugar
13. To study Anthron method
14. Quantification of RNA by Orcinol method
15. To estimate amount of protein by Biuret method.

Practical Assessment:

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7

2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

MICRO PROJECT

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Tech. **Degree:** B.Tech. Biotechnology

Course Code: BBL-118 **Course Title:** Micro Project

Credits allocated: 0+1 (1 Practical) **Level of Study:** UG

Total Hours:

Mode of delivery, planned learning activities and teaching method: Project 2 hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester I

Project Assessment:

Idea of Project	**Understanding of Subject**	**Literature survey**	**Attendance**	**Total Marks**
5	5	5	5	20
External Assessment				30

Total Marks	50

Ideas of project:

Defining projects ideas is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management.

Literature survey:

A literature review establishes familiarity with and understanding of current research in a particular field before carrying out a new investigation. Conducting a literature review should enable you to find out what research has already been done and identify what is unknown within your topic.

- **Attendance:**

In ongoing semester attendance are important for students. They are expected to do their project in the semester that is timetabled. The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

Gandhian Studies

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B.Tech. Biotechnology

Course Code: GS-1 **Course Title:** Gandhian Studies

Credits allocated: Audit **Level of Study:** UG

Recommended Year /Semester: B.Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the principal. The approved courses must be mentioned in the roster form

Objective:

To orient the students with the basic principles of life, that may enable them to grow as a complete individual and a responsible social being, in a manner that is progressive, inclusive and sustainable.

Learning Outcomes:

1. Students learn the principles, practice and method of nonviolence through the life, work and thought of Mahatma Gandhi

2.Students learn / understand nonviolence as a way of life as a central principle that enable them see a sense of larger purpose in whatever stream of profession they undertake.

3. Students take keen interest in pursuing life sustainably (in a manner reflecting the Sarvodaya principle 'welfare of individual is contained in the welfare of all). Begin to sense the integral self (individual, society, nation, humanity, life and creation)

Detailed Syllabus

Unit I: Life and work of Gandhi (Introduction to) (Six Hours)

a. Childhood, Student life and learnings.
b. S.A experience (socio, political and methodological).
c. Ashram living in India; Satyagraha's in India; Constructive action.
d. Freedom struggle; Gandhi and his contemporary leaders
e. Demystify Gandhi: Dispel controversies about Gandhi and his methods

(Elaborate in each segment one incident or one action or one intervention whichever is relevant and then introduce the remaining in brief for students to explore. For example, one satyagraha or one constructive program can be explained in great detail and then we just introduce the list of other satyagraha's / constructive programs for students self-learning).

Unit II: Principles and concepts of Gandhi (seven Hours)

a. **Truth and Nonviolence** (meaning, fundamental; law of nature interrelatedness (unstamped metallic disc); empirical application; Life as the closest manifestation of the Ultimate (Truth).
b. **Sarvodaya:** the concept of community (interdependence); Sarvodaya through antyodaya.
c. **Swaraj:** Self-rule; self-consciousness; self-realization: self through society; poorna swaraj.
d. **Swadeshi:** Neighbourhoodliness; reciprocal – bilateralism.

e. **Gandhian Ethics:** Justice, equality and freedom, Rights-Duties consciousness.

Unit III: Methods (techniques) of Gandhian Action: (seven Hours)

a. **Satyagraha** (nonviolent resistance): meaning, concept, methodology; Insistence on Life.
b. **Satyagraha as a way of life:** ends and means; harmonizing word-thought-deed.
c. **Appropriate tech:** Optimization; small is beautiful: concentric circular arrangement; learning by doing.
d. **Constructive intervention:** building neighbourhood constructively; self-social responsibility, accountability; Khadi a case study for sustainable economics.
e. **Gandhian Communication:** Journalist Gandhi and communication.

Unit IV: Gandhian Action/ Practice: (10 hrs)

a. Interaction with practitioners
b. Nonviolence Workshop
c. Workshop on Conflict Transformation (Satyagraha) or Peace (Welfare of All)
d. Practice of Nonviolence and Truth in day-to-day life
e. One Constructive Action
f. One insistence on truth

Reference Book/ suggested Reading/ Textbook:

1. M. K Gandhi, The Story of My Experiments with Truth, Navjivan Publishing House, Ahmedabad
2. Louis Fischer, Mahatma Gandhi His Life and Times, Bharatiya Vidya Bhavan, Mumbai
3. M K Gandhi, The Hind Swaraj, Navjivan Publishing House, Ahmedabad
4. M K Gandhi, From Yarvada Mandir (Mangal Prabhat / Ashram observances), Navjivan Publishing House, Ahmedabad
5. M K Gandhi, Constructive Programme Its Meaning and Place, Navjivan Publishing House, Ahmedabad
6. R K Prabhu and U R Rao (Eds), The Mind of Mahatma, Navjivan Mudralaya, Ahmedabad

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

UNIVERSAL HUMAN VALUES

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree** B. Tech. Biotechnology

Course Code: UNC-02 **Course Title:** Universal Human Values

Credits allocated: 2 Theory **Level of Study:** UG

Mode of delivery, planned learning activities and teaching method: Theory 2 hrs / weekly

Recommended Year /Semester: B. Tech. Biotechnology Year 1/ Semester I

Prerequisite- Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal.

Course Objective-

1.To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding

of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature

Course Outcome- This course is intended to provide a much needed orientational input in value education to the young enquiring minds.

THEORY

UNIT I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha

3. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Swasthya

UNIT III: Understanding Harmony in the Family and Society

1. Understanding Harmony in the Family and Society- Harmony in HumanHuman Relationship 13.
2. Understanding Harmony in the family – the basic unit of human interaction
3. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
4. Understanding the meaning of Vishwas; Difference between intention and competence
5. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
6. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

   Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

   - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT IV: Understanding the harmony in the Nature

1. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence
2. Interconnectedness and mutual fulfillment among the four orders of naturerecyclability and self-regulation in nature
3. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
4. Competence in professional ethics:
    a. Ability to utilize the professional competence for augmenting universal human order.
    b. Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems.
    c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
    a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    b. At the level of society: as mutually enriching institutions and organizations.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
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Total Marks	100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

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No. of unit test	Total Marks
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- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

ENGLISH COMMUNICATION ESSENTIALS

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree** B. Tech. Biotechnology

Course Code: BTB 119 **Course Title:** English Communication Essentials

Level of Study: UG **Credits allocated:** 2+0

Recommended Year /Semester B. Tech. Biotechnology Year 1/ Semester I

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal

Course Objective- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Course Outcome- While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

THEORY

UNIT-I: Communication andCommunication Process

Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcomingthem, Verbal and Non-verbal Communication, Ways of Effective Communication.

UNIT-II: Oral Communication

Group Discussion: Principles andPractice of Group Discussion.
Interview skills: Preparation, Types, Questions and Techniquesof Interview.
Presentation skills: Elements ofeffective presentation, Structureand tools of presentation, Body language & confidence

UNIT-III: Study of Sounds inEnglish

Introduction to phonetics, Sounds: Vowels & Consonants, Articulation of Different Sounds in English, Stress & Intonation..

UNIT-IV: English Grammar

Overview of basic Mid-level grammar, Parts of speech, Prepositions and Conditionals, Tenses& concept of time, Sentenceconstruction, vocabulary building: Synonyms and Antonyms, Idioms

& Phrases

UNIT-V: Writing Skills

Different writing Styles, BusinessLetters, Email writing, Report Writing, Job Application and Resume.

Unit – VI: Listening Skills &Reading Skills

Listening: Active and Passive Listening Reading: Techniques of Reading: Skimming & Scanning.

Reference

1. Ashraf Rizwi, Communication Skills For Engineers , Tata Mcgraw Hill
2. Sanjay Kimar, Pushpa Lata, Communication Skills, Oxford University Press, 2016
3. Meenakshi Raman, Sangeeta Sharma Communication Skills, Oxford University Press, 2017
4. Anderson, Kenneth,Joan Maclean And Tossny Lynch. Study Speaking. A Course In Spoken English For Academic Purposes. Cambridge CUP, 2014
5. Bellare, Nirmala, Reading Strategies Vol 1 And 2. New Delhi University Press, 1998
6. Bhasker, W.W.S And Prabhu, N.S: English Through Reading, Vol 1 And 2 Macmillian, 1975.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MGM UNIVERSITY, AURANGABAD

INSTITUTE of BIOSCIENCES AND TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

CURRICULUM

w. e. f. Academic Year 2021-22

Faculty of Engineering and Technology

Graduate (UG) Program

B.Tech. (UG)

B.TECH. BIOTECHNOLOGY- CURRICULUM

SEMESTER-II

Detail Course Layout with course content

1st Year II Semester

BTB-121	Numerical and Computational Fundamentals	4+0
BTB-122	Enzymology	4+0
BTB-123	Molecular Biology of Gene	4+0
BTB-124	Basic Immunology	4+0
BBL-125	Mendel And Darwin Theory	4+0
BBL-126	Computational Lab	0+1
BBL-127	Immno Enzyme Lab	0+1
BBL-128	Micro Project-I	0+1

BTB-129 Communication Skills Audit

Semester II																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 121	Numerical And Computational Fundamentals-I	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 122	Enzymology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4

BTB 123	Molecular Biology of Gene	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 124	Basic Immunology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-125	Mendel And Darwin Theory	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-126	Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-127	Immuno Enzymo Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-128	Micro Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
	Communication skills	Theory	2	-	-	10	10		30	-	50	-	-	-	12	-	20	Audit
	Total		**17**	**5**	**6**	**110**	**110**	**60**	**330**	**90**	**700**	**0**	**0**	**24**	**132**	**36**	**280**	**23**

NUMERICAL AND COMPUTATIONAL FUNDAMENTALS I

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech-Biotechnology (UG)

Course Code- BTB-121 **Course Title:** Numerical and Computational Fundamentals –I

Credits- 4+0 (4Theory) **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 2 hrs/weekly

Recommended Year /Semester: B. Tech-Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective:

1. To develop an understanding of basic mathematical tools and their application.
2. To model real world problems into mathematical expressions using numerical representation.

Learning Outcomes:

1. Use knowledge of content and mathematical procedures to solve problems.
2. Understand the fundamental ideas and application of Calculus.

COURSE CONTENTS

THEORY

UNIT I: Introduction:

Numbers, Strings, Lists, Loop, Functions, Data Structures, List, Tuples, Dictionaries, Packages, pip,The dir() Function

UNIT II: Data analysis

Biostatistics, Data Input and Output, Formatted String Literals, The String format() Method

UNIT III: Machine Learning

Population studies, Distribution, ANOVA, Regression, multivariate analysis

UNIT IV: Quadratic Equations

Introduction, Quadratic equation, Factorization method, Completing square method, Formula method, Nature of roots.

UNIT V: Permutation and Combination

Introduction, Factorial notation, Permutation, Combination.

Suggested Reading Book:

1. Class XI Mathematics, NCERT

2. Class X Mathematics, NCERT

Assessment Method:

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

ENZYMOLOGY

University- MGM University, Aurangabad
Faculty- Engineering and Technology
Institute- Institute of Biosciences and Technology
Degree- B.Tech. Biotechnology
Course Code- BTB 122
Course Title- Enzymology
Credits- 4+0 (4 Theory)
Level of Study: UG
Mode of delivery planned learning activities and teaching method: Lecture 3hrs / weekly
Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: Primary goals of this course is to provide the students with detailed knowledge in enzyme activity and kinetics, their mechanism of action and regulation and about the way of enzyme application and exploitation.

Learning Outcomes:

The course include deepening knowledge in the areas of purification and isolation of enzymes, classification of enzymes and cofactors, kinetics and regulation of enzymes and their applications in industry, therapeutics and diagnosis.

THEORY

UNIT I: CLASSIFICATION AND ENZYME ACTION

Nomenclature and classification of enzymes. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor. Introduction to Biocatalysis, differences between chemical and biological catalysis. Active site, Enzyme specificity. Principles of energy of activation, transition state. Interaction between enzyme and substrate-lock and key, induced fit models. Fundamentals of enzyme assay, enzyme units.

UNIT II: ENZYME KINETICS AND INHIBITION

Kinetics of single substrate enzyme - catalysed reactions - Michaelis - Menten equation, importance of Vmax, Km, MM equation, and turnover number; Lineweaver - Burk plot, Kinetics of Allosteric enzymes - MWC and KNF models Hill' equation coefficient. Kinetics of multi - substrate enzyme - catalysed reactions - Ping-pong bi-bi, random order and compulsory order mechanism. Enzyme inhibition-Classification (a) competitive (b) noncompetitive (c) uncompetitive (d) substrate

UNIT-III: MECHANISM OF ENZYME CATALYSIS

Enzyme specificity, Mechanism of enzyme action - general acid-base catalysis, covalent catalysis, proximity and orientation effects, role of metal ion in enzyme catalysis, mechanism of serine proteases - chymotrypsin, lysozyme, and ribonuclease.

UNIT-IV: REGULATION

Partial Proteolysis, Phosphorylation, adenylylation, disulphide reduction, Allosteric regulation (1) sigmoidal kinetics (2) symmetry model (3) concerted model (4) kinetics and functions of allosteric enzymes (a) phosphofructokinase (b) glycogen phosphorylase

UNIT-V: INDUSTRIAL USES OF ENZYMES

Sources of industrial enzymes, thermophilic enzymes, amylases, glucose isomerases, cellulose degrading enzymes, lipases, proteolytic enzymes in meat and leather industry, detergents and cheese production. Clinical enzymology - Enzymes as thrombolytic agents, antiinflammatory agents, digestive aids. Therapeutic use of asparginase, streptokinase. Diagnostic enzymes. Immobilization of enzymes and their applications. Abzymes

References

1. Understanding enzymes: Palmer T., Ellis Harwood ltd., 2001.
2. Enzyme structure and mechanism. Alan Fersht, Freeman & Co. 1997
3. Principles of enzymology for food sciences: Whitaker Marc Dekker 1972.
4. Principles of Biochemistry, White. A, Handler, P and Smith.
5. Biochemistry, Lehninger A.L.
6. Biochemistry, Lubert Stryer.
7. Review of physiological chemistry, Harold A. Harper.
8. Text of Biochemistry, West and Todd.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MOLECULAR BIOLOGY OF GENE

University- MGM University, Aurangabad
Faculty- Engineering and Technology
Institute- Institute of Biosciences and Technology
Degree- B.Tech. Biotechnology
Course Code- BTB- 123
Course Title- Molecular Biology of Gene
Credits- 4+0 (4Theory)
Level of Study: UG
Mode of delivery planned learning activities and teaching method: Lecture 3hrs / weekly
Total Hours:
Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

The course is an introduction to molecular biology and genetics and methods used within these fields. The subject content is the following.

The structure of the genome: chromosomes, chromosomal structure, and extrachromosomal inheritance. The molecular basis of transmission of genetic information: nucleic acids and proteins. DNA replication, DNA repair, mutations, recombination, transposition, transcription, and translation. Examples of gene regulation.

Learning Outcomes:

After the course, the student should be able to:

account for structure, formation and function of DNA, RNA and proteins

describe the principles of gene regulation in prokaryotic and eukaryotic cells

describe the consequences of different types of mutations and DNA-repair systems, recombination, restriction enzymes, operons and gene expression.

use some and understand several modern molecular methods to elucidate molecular and genetic questions

critically analyse, evaluate and compile results from laboratory exercises

reason about ethical aspects of genetics.

COURSE CONTENTS

THEORY

UNIT I: DNA REPLICATION

Prokaryotic and eukaryotic DNA replication – mechanism of replication, enzymes and necessary proteins in DNA replication.

DNA Mutation and Repair - mutation subtypes, mismatch, base-excision and nucleotide excision.

DNA recombination - homologous, non - homologous and site-specific.

UNIT II: TRANSCRIPTION

Prokaryotic and eukaryotic transcription - RNA polymerases - general and specific transcription factors- regulatory elements. Mechanism of transcription regulation and transcription termination. Post-transcriptional modification - 5’ cap formation- 3’end processing and polyadenylation- splicing editing- nuclear export of mRNA- mRNA stability.

UNIT III: TRANSLATION

Genetic code - Prokaryotic and eukaryotic translation - translational machinery. Mechanism of initiation - elongation and termination. Regulation of translation.

UNIT IV: REGULATION OF ACTIVITY OF GENES AND GENE PRODUCTS IN PROKARYOTES

General aspects of Regulation, The lactose system and the operon model, The Galactose operon, The Arabinose operon, The Tryptophan operon, Relative positions of Promoters and Operators, Regulons, Regulation of Translation, Regulation of the synthesis of Ribosomes, Unregulated changes in gene expression, Feedback Inhibition.

UNIT V: REGULATION IN EUKARYOTES

Regulatory strategies in Eukaryotes, Gene alteration (Gene loss, Gene amplification, Gene rearrangement: the joining of coding sequences in the immune system) Transcriptional Control by hormones, Regulation mediate through Transcription factors, Regulation of enhancer activity, Methylation, Regulation of processing, Translational control, Regulation of gene expression in plant cells by light.

References:

1. Molecular Biology –David Frifelder
2. Genes IX –Benjamin Lewin
3. Molecular biology of the gene J. D. Watson and *et. al.*,
4. Molecular Biology of the Cell –Bruce Alberts and *et. al.*,

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

BASIC IMMUNOLOGY

University- MGM University, Aurangabad
Faculty- Engineering and Technology
Institute- Institute of Biosciences and Technology
Degree- B.Tech. Biotechnology
Course Code- BTB 124
Course Title- Basic Immunology
Credits- 4+0 (4 Theory)
Level of Study: UG
Mode of delivery planned learning activities and teaching method: Lecture 2hrs / weekly
Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Course Objective 1. Students should gain an understanding of basic aspects of the structure and functions of the immune system. 2. Students should describe the applied aspects of immunology such as defense mechanism, allergy and auto immunity. 3. Students should understand the cellular and molecular interaction of the immune responses.

Learning Outcomes: The primary goal is to make Current understanding of the cellular and molecular interactions in the inductions, expression, and regulation of the cellular and humoral immune responses; recent knowledge and applications concerning immunity to various

microbial infections as well as antigen-antibody interactions; and detection of cell-mediated immune response.

COURSE CONTENTS

THEORY

UNIT I- IMMUNE SYSTEM

Introduction to biology of the immune system, Organs and cells of immune system. Innate and acquired immunity, Primary and Secondary lymphoid organs

UNIT II- ANTIGENS AND ANTIBODIES

Nature of Antigen and Antibody, Antigen-Specificity, avidity, affinity, cross reactivity, haptens, adjuvants, epitopes, Basic structure of antibodies ii) Classes of antibodies and biological activity iii) Polyclonal antibodies, Antigen-antibody interactions – Principles and applications

UNIT III- RECOGNITION OF ANTIGENS

Major Histocompatibility Complex, Antigen processing and presentation, B- cell Maturation, Activation and Differentiation, T- cell receptor – Structure and role, T- cell Maturation, Activation and Differentiation

UNIT IV-IMMUNE EFFECTOR MECHANISMS

Cytokines- - IL-1, IL-2, IL-4, IFNs and TNFs, Cytokine secretion by TH1 and TH2 cells, Complement pathways- Classical, alternate and lectin pathways , Biological consequences of complement activation, Complement fixation tests, Cell-mediated cytotoxicity of T cells, NK cells, ADCC

UNIT V- ANTIGEN-ANTIBODY INTERACTIONS

Antigen-antibody interactions –Principles and applications, Precipitation, Immunoelectrophoresis, Agglutination, Radioimmunoassay, ELISA, Immunofluorescence, Monoclonal antibodies (Hybridoma Technique).

Reference Books

1. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kubyís Immunology. 6th edition W.H. Freeman and Company, New York.
2. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication

3. Cellular & Molecular Immunology, 7th Edition, Abul K. Abbas & Andrew H. Lichtman & Shiv Pillai, 2011

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MENDEL AND DARWIN THEORY

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology (UG)

Course Code- BTB-125 **Course Title:** Mendel and Darwin Theory

Credits allocated: 4+0 (Theory) **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 2 hrs/weekly

Recommended Year /Semester: B. Tech- Biotechnology (UG) Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective:

1. To develop an understanding of basics of evolution and ideas of evolution.
2. To understand about the cause of heredity and variation.

Learning Outcomes:

1. Use knowledge of genetics in the improvement of various traits.
2. Understand the fundamental ideas about the evolution

COURSE CONTENTS

THEORY

UNIT I: Origin and Evolution of Life

Origin of Life, The meaning of evolution, Ideas of evolution before Darwin, Evidences of Evolution, Theories of Evolution: Lamarck's theory, Theory of germplasm, Darwin's theory. Modern views of Darwinism. Genetic basis of adaptation, Species concept.

UNIT II: Inheritance

Heredity and Variation, Genetics terms and symbol, Pre mendelian ideas of inheritance, John Gregor Mendel, Theoroes of inheritance: Law of dominance, Law of seggregation and law of Independent assortment. Rediscovery of Mendel's work.

UNIT III: Traits and Alleles

Post mendelin era: other pattern of inheritance. Incomplete dominanace, Multiple alleles, epistasis, polygenic traits, Pleotropy.

UNIT IV: Chromosomal Theory

Parallelism between genes and chromosomes, Chromosomal theory of inheritance, Linkage and recombination

UNIT V: Chromosomal Variation

Genetic variation, Sex linked inheritance, Basics of sex determination, chromosomal mapping.

Reference

1. Principles of Genetics:Robert H. Tamarin 7th ed. Tata McGraw Hill Publication. 2002.
2. Principles of Genetics: Gardener Simmons.
3. Genetics by Strictberger.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

COMMUNICATION SKILLS

University- MGM University, AURANGABAD **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code- BBL-126 **Course Title**-Communication Skills

Credits- 0+01 **Level of Study:** UG

Mode of delivery planned learning activities and teaching method:

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective: The overall aims of the course are: a. to enable the learner to communicate effectively and appropriately in real life situation: b. to use English effectively for study purpose across the curriculum; c. to develop interest in and appreciation of Literature; d. to develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing; e. to revise and reinforce structure already learnt

Learning Outcomes: Students will gain confidence in their personality. They will understand the skills and use it in their respective fields. They will get command over the language.

COURSE CONTENTS

THEORY

UNIT I- COMMUNICATION AND COMMUNICATION PROCESS

Introduction to Communication, Forms and Function of Communication, Barriers to Communication and Overcoming Them, Verbal and Non- Verbal Communication, Ways of Effective Communication.

UNIT II- ORAL COMMUNICATION

Group Discussion, Principles and Practice of Group Discussion, Interview Skills: Preparation, Types, Question and Techniques of Interview. Presentation Skills: Elements of Effective Presentation, Structure and Tools of Presentation, Body Language and Confidence

Unit III- Study of Sounds in English

Introduction to Phonetics Sounds: Vowels and Consonants, Articulate of Different Sounds in English, Stress and Intonation.

UNIT IV- ENGLISH GRAMMAR

Overview of Basic Mid-Level Grammar, Parts of Speech, Preposition and Conditionals, Tenses and Concept of Time, Sentence Construction, Vocabulary Building: Synonyms and Antonyms, Idioms and Phrases

UNIT V- WRITING SKILLS

Different Writing Skills, Business Letters, Email Writing, Report Writing, Job Application and Resume

UNIT VI- LISTENING SKILLS AND READING SKILLS

Listening: Active and Passive Listening Reading: Technique of Reading: Skimming and Scanning

Reference

7. Ashraf Rizwi, Communication Skills For Engineers , Tata Mcgraw Hill
8. Sanjay Kimar, Pushpa Lata, Communication Skills, Oxford University Press, 2016
9. Meenakshi Raman, Sangeeta Sharma Communication Skills, Oxford University Press, 2017
10. Anderson, Kenneth,Joan Maclean And Tossny Lynch. Study Speaking. A Course In Spoken English For Academic Purposes. Cambridge CUP, 2014
11. Bellare, Nirmala, Reading Strategies Vol 1 And 2. New Delhi University Press, 1998
12. Bhasker, W.W.S And Prabhu, N.S: English Through Reading, Vol 1 And 2 Macmillian, 1975.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

COMPUTATIONAL LAB (Mol Bio)

University- MGM University, AURANGABAD **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Title- Computational Lab **Course Code**- BBL-127

Credits- 1+0 **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 6 hrs/weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective and Outcome: To understand the classification & nomenclature of enzymes and the factors effecting enzymatic reaction. The students will be able to identify the cellular and molecular basis of immune responsiveness. The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

COURSE CONTENTS

Practical

Basic Electrical Engineering Practical

1. To identify different electrical measuring instruments
2. To measure voltage and current in electrical Circuit by voltmeter and ammeter.
3. To measure Power in electrical Circuit by Wattmeter
4. To Measure Electrical Energy in electrical circuit by Energy meter.
5. To determine Series equivalent of resistance
6. To determine parallel equivalent of resistance
7. Charging and discharging test on capacitor
8. To check insulation by Using insulation tester
9. Test circuit using series lamp and millimetre
10. To check earth resistance by Using the earth tester
11. For the given magnetic material find the B-H curve and hysteresis loop.
12. Use Faraday's first law of electromagnetic induction to analyses the behaviors of statically induced E.M.F. and Dynamically induced E.M.F in the given circuit.

Assessment

Practical Assessment (Marks distribution):50				
Components	Attendance	Table Viva	Record Book	Total Marks
Internal Marks	10	05	05	20
External Assessment: Semester End Practical Examination				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practical's in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge.

- **Attendance–**In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars).The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

IMMUNO-ENZYMO LAB

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code- BBL-127 **Course Title**- Immuno –Enzymo Lab

Credits-0+1 **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 6 hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective and Outcome: To understand the classification & nomenclature of enzymes and the factors effecting enzymatic reaction. The students will be able to identify the cellular and molecular basis of immune responsiveness. The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

COURSE CONTENTS

Practical

1)Assay of amylase.

2)Assay of urease.

3)Assay of catalase .

4) Effect of pH,temp and substrate concentration on enzyme activity.

5) Estimation of glucose by DNS method.

6) Estimation of glucose by Benedictis trimetric method.

7) Estimation of total carbohydrate.

8)Test for lipids -Salkowski test,Lieberman-Burchard test.

9) Estimation of Amino Acid by Ninhydrin Method.

10) Estimation of protein by Biuret Method.

11)Blood staining.

12)Blood Grouping.

13)Rh factor detection .

14)Serum and plasma separation.

15)Radial immuno diffusion.

16) Antibiotics sensitive by paper disc Method .

17)Double diffusion.

18) Widal test.

19) To study immuno electro to detect Ag -Ab interaction.

20) Isolation of H and O Antigen from S.typhi.

21) Isolation of immunoglobulin by Ammonium sulphate precipitation.

22) Extraction and isolation of IgG ab from hen's egg.

Assessment

Practical Assessment (Marks distribution):50				
Components	Attendance	Table Viva	Record Book	Total Marks
Internal Marks	10	05	05	20
External Assessment: Semester End Practical Examination				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practical's in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge.

- **Attendance–**In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars).The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

MICRO-PROJECT

University- MGM University, AURANGABAD **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree** B. Tech-BioTechnology (UG)

Course Title- Micro project **Course Code**-BBL-128

Credits-0+1 **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Practical 4 hrs / weekly

Total Hours:

Recommended Year /Semester: B. Tech.. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective- Students will get familiar to the topic in detail. They will have hands on different instruments. They will develop technical handling skills.

Learning outcomes- Students will gain knowledge about need of research in particular field and the idea development of how the lacuna can be erased that can be of social benefit.

COURSE CONTENTS

Practical

1. Synopsis
2. Project work
3. Thesis Writing
4. Presentation

Project Assessment

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
5	5	5	5	20
External Assessment				30
Total Marks				50

Ideas of project:

Defining projects ideas is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management.

Literature survey:

A literature review establishes familiarity with and understanding of current research in a particular field before carrying out a new investigation. Conducting a literature review should enable you to find out what research has already been done and identify what is unknown within your topic.

Attendance:

In ongoing semester attendance are important for students. They are expected to do their project in the semester that is timetabled. The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

COMMUNICATION SKILLS

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code- BTB-129 **Course Title**- Communication Skills

Credits-Audit **Level of Study: UG**

Mode of delivery planned learning activities and teaching method:

Recommended Year /Semester: B.Tech. Biotechnology, Year 1/ Semester II

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective: The overall aims of the course are : a. to enable the learner to communicate effectively and appropriately in real life situation: b. to use English effectively for study purpose across the curriculum; c. to develop interest in and appreciation of Literature; d. to develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing; e. to revise and reinforce structure already learnt

Learning Outcomes: Students will gain confidence in their personality. They will understand the skills and use it in their respective fields. They will get command over the language.

COURSE CONTENTS

THEORY

UNIT I- COMMUNICATION AND COMMUNICATION PROCESS

Introduction to Communication, Forms And Function of Communication, Barriers to Communication And Overcoming Them, Verbal and Non- Verbal Communication, Ways of Effective Communication.

UNIT II- ORAL COMMUNICATION

Group Discussion, Principles And Practice of Group Discussion, Interview Skills: Preparation, Types, Question and Techniques of Interview. Presentation Skills: Elements of Effective Presentation, Structure and Tools of Presentation, Body Language And Confidence

Unit III- Study of Sounds in English

Introduction to Phonetics Sounds: Vowels and Consonants, Articulate of Different Sounds in English, Stress and Intonation.

UNIT IV- ENGLISH GRAMMAR

Overview of Basic Mid-Level Grammar, Parts of Speech, Preposition and Conditionals, Tenses and Concept of Time, Sentence Construction, Vocabulary Building: Synonyms and Antonyms, Idioms and Phrases

UNIT V- WRITING SKILLS

Different Writing Skills, Business Letters, Email Writing, Report Writing, Job Application and Resume

UNIT VI- LISTENING SKILLS AND READING SKILLS

Listening: Active and Passive Listening Reading: Technique of Reading: Skimming and Scanning

Reference

1. Ashraf Rizwi, Communication Skills For Engineers , Tata Mcgraw Hill
2. Sanjay Kimar, Pushpa Lata, Communication Skills, Oxford University Press, 2016
3. Meenakshi Raman, Sangeeta Sharma Communication Skills, Oxford University Press, 2017
4. Anderson, Kenneth,Joan Maclean And Tossny Lynch. Study Speaking. A Course In Spoken English For Academic Purposes. Cambridge CUP, 2014
5. Bellare, Nirmala, Reading Strategies Vol 1 And 2. New Delhi University Press, 1998
6. Bhasker, W.W.S And Prabhu, N.S: English Through Reading, Vol 1 And 2 Macmillian, 1975.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40

External Assessment: Semester End Theory Examination	60
Total Marks	100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MGM UNIVERSITY, AURANGABAD

INSTITUTE of BIOSCIENCES AND TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

CURRICULUM

w. e. f. Academic Year 2021-22

Faculty of Engineering and Technology

Graduate (UG) Program

B.Tech. (UG)

B.TECH. BIOTECHNOLOGY- CURRICULUM

SEMESTER-III

Detail Course Layout with course content

2st Year III Semester

BTB-231	Numerical And Computational Fundamental II	3+0
BTB-232	Genetics And Evolution	3+0
BTB-233	Chemistry of Biomolecules	3+0
BTB-234	Microbe infection And Immunity	4+0

BBL-235	Instrumention In Biotechnology	4+0
BBL-237	Seminar(Subject base seminar)	0+1
BBL-238	Bio-Computational Lab.	0+1
BBL-239	Genticcs Lab	0+1
BBL-230	Mini Project	0+1
UNC-01	Enviromental studtes	Audit
UNC02	Gandhian study	Audit

Semester III																			
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 231	Numerical And Computational	Theory	2	1	-	20	20	-	60	-	100	-	-	-	24	-	40	3

	Fundamentals-II																	
BTB 232	Genetics And Evolution	Theory	2	1	-	20	20	-	60	-	100	-	-	-	24	-	40	3
BTB 233	Chemistry of Biomolecules	Theory	2	1	-	20	20	-	60	-	100	-	-	-	24	-	40	3
BTB 234	Microbe infection And Immunity	Theory	3	1	-	20	20	-	60	-	100	-	-	-	24	-	40	4
BTB 235	Instrumentation In Biotechnology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-237	Seminar (Subject Base Seminar)	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-238	Bio-Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-239	Genetics Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-230	Mini Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
UNC-01	Environmental Studies	Theory	2	-	-	10	10	-	30	-	50	-	-	-	12	-	20	Audit
	Total		**16**	**5**	**8**	**100**	**120**	**80**	**330**	**120**		**8**	**16**	**32**	**132**	**48**	**300**	**21**

NUMERICAL AND COMPUTATIONAL FUNDAMENTALS I

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech-B.Tech. Biotechnology

Course Code- BTB- 231 **Course Title:** Numerical & Computational Fundamentals –I

Credits- 3+0 **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 3 hrs/weekly

Recommended Year /Semester: B. Tech-Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective:

1. To develop an understanding of basic computational tools and their application.
2. To model real world problems with computational fundamental

Learning Outcomes:

1. Use knowledge of computational
2. Understand the fundamental ideas and application of Calculus.

THEORY

UNIT -I: PRELIMINARIES OF COMPUTING

Basic Concepts : Round Off errors, Floating Point Arithmetic, Convergence.

UNIT -II: NUMERICAL SOLUTION OF NONLINEAR EQUATIONS.

Bisection method, fixed- point iteration, Newton's method, Error analysis for Interative Methods, Computing roots of polynomials

UNIT – III: INTERPOLATION AND POLYNOMIAL APPROXIMATION

1. Lagrance polynomial
2. Divided Differences
3. Hermite Interpolation

UNIT- IV: NUMERICLA INTEGRATION AND DIFFERENTIATION

Trapezoidal rules, etc., Gaussian quadrature and Euler-Maclaurin formula

UNIT –V: APPLIED LINEAR ALGEBRA

Direct methods for solving linear systems, numerialfactorizations. Eigenvalue problems.

REFERENCES-

1. J.Store and R. Bulirsch, Introduction to Numerical Analysis , Soringer-Verlage,
   L.N. Trefethen and D. Bau. Numerical Linear Algebra, Society of Industrial and Applied Mathematics.
2. C.T. Kelley, Interative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

GENETICS AND EVOLUTION

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code- BTB 232 **Course Title**- Genetics And Evolution

Credits- 3+0 **Level of Study: UG**

Mode of delivery planned learning activities and teaching method: Lecture 3hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: Primary goals of this course is to provide the students with detailed knowledge in environmental activity and genetics, their mechanism of action and regulation and about the way of evolution application and exploitation.

Learning Outcomes:

The course include evolution is process that results in changes in genetic materials of a population over time .Evolution reflects the adaptation of organisms to their changing environmental and can result in altered genes .

THEORY

UNIT I : GENITICS

MENDELIAN PRINCIPLE

1. Law of dominance
2. Law of segregation
3. Law of Independent assortment

CONCEPT OF GENES: Multiple alleles, Pseudoalleles, Complementional test

EXTENSION OF MENDELIAN PRINCIPLE

Codominance, Incomplete dominance, Gene interaction (Epitasis), Pleiotrophy, Genomic, imprinting, Linkage and Crossing over, Sex Linkage, Sex limited and sex influenced Characters

UNIT II: GENE MAPPING METHOD

Linkage maps, Tetrad analysis, Mapping with molecular markers,

MICROBIAL GENETICS

Methods of genetics transfer

-Transformation

-Conjugation

-Transduction and Sex duction

UNIT-III : MUTATION

Types of mutaton, Causes and Detection, Mutant types: Lethal, Conditional, Biochemical Mutant; Lose of function and Gain of function, Germinal verses somatic mutant, Insertional mutagenesis

UNIT-IV EVOLUTION

Introduction, Theories of organic evolution, Example and types of natural selection, Classification of evolution, Evidence for evolution through clodegenesis

UNIT-V : I ADAPTATION

Adaptation, Adaptation radiation, Speciation, Nature Speciation, Mode of Speciation, In stastaneous Speciation

References

9. Hexter and Yost- The science of genetics .
10. Hartman and surkind – Gene Action.
11. Sinnot ,Dunn and Duzhansky – Principle of genetics.
12. Simmor .S and Snusted : Principle of genetics 8th Edition, John Wiley and Sons Inc.NY
13. Evolution and Ecology by P.S, Verma and V.K .Agrawal

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

CHEMISTRY OF BIOMOLECULES

University- MGM University, Aurangabad
Faculty- Engineering and Technology
Institute- Institute of Biosciences and Technology
Degree- B.Tech. Biotechnology
Course Code- BTB- 233
Course Title- Chemistry of Biomolecules
Credits- 3+0 (3Theory)
Level of Study: UG
Mode of delivery planned learning activities and teaching method: Lecture 3hrs / weekly
Total Hours:

Recommended Year /Semester: B.Tech. Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

The course is an introduction to chemistry and biomolecules and methods used within these fields. The subject content is the following.

The structure of the bomolecules

Study the structure of carbohydrates, proteins ,nucleic acid ,lipids and vitamines.

Learning Outcomes:

After the course, the student should be able to:

account for structure, classification and function carbohydrates,proteins , nucleic acid and vitamins, Structure of atoms , molecules and chemical bond.(bond strength,cleavage of C-C bond) Stabilization interactions, Thermodynamics laws ,enthalpy

COURSE CONTENTS

THEORY

UNIT I: FUNDAMENTAL

Structure of atoms , molecules and chemical bond.(bond strength,cleavage of C-C bond)

Stabilization interactions, Vander waals, Electrostatic, Hydrogen bonding, Hydrophobic interaction.

THERMODYNAMICS: Laws, Concept of entropy, Enthalpy, Equilibrium constant, Free energy changes for ATP Hydrolysis.

BIOENERGETICS

-Oxidative phosphorylation (ETC) coupled reaction,(redox reaction)group transfer.

Biological energy transducer, Substrate level Phosphorylation

UNIT II: CARBOHYDRATES

Classification of carbohydrate, Composition, Structure, Function, Metabolism (Glycolysis ,TCA cycle ,HMP pathway ,Gluconeogenesis), Disorders(diabetes ,Hypoglycemia)

UNIT III:PROTEINS

Classification of protein, Composition, Structure (primary, secondary and tertiary)

Function, Amino acid Metabolism, Biosynthesis, Degradation, Regulation, Disorder(Phenylketoneria)

UNIT IV: NUCLEIC ACID

Classification, Composition of nucleic acid, Structure(A,B,Z-DNA), Function, Metabolism, Boisynthesis and regulation of purins and pyrimidins by salavage pathway, Disorder

UNIT V: LIPIDS AND VITAMINES

LIPIDE: Classification, Composition, Structure, Function, Storage lipids, Membrane lipids, Essential and Non Essential fatty acids, Metabolism, General reaction function , Biosynthesis and degradation, Disorder (Triglyceridemia ,Nayman sacchs)

VITAMINS: Classification, Function, Role in metabolism, Disorder

References:

1. Cohn and Stump –outline of Biochemistry Wiley Estern Ltd.

2. Harpers Review of Biochemistry –Prentice Hall

3.Cregntine- Protein structure and Molecular properties

4.Lubert Stryer-Biochemistry

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MICROBES INFECTION & IMMUNITY

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code-BTB 234 **Course Title**- Microbes Infection & Immunity

Credits- 4+0 (4Theory) **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 3hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 2/ Semester III

Course Objective 1. Students should gain an understanding of basic aspects of the structure and functions of the immune system. 2. Students should describe the applied aspects of immunology such as defense mechanism, allergy and auto immunity. 3. Students should understand the cellular and molecular interaction of the immune responses.

Learning Outcomes: The primary goal is to make Current understanding of the cellular and molecular interactions in the inductions, expression, and regulation of the cellular and humoral immune responses; recent knowledge and applications concerning immunity to various microbial infections as well as antigen-antibody interactions; and detection of cell-mediated immune response.

COURSE CONTENTS

THEORY

UNIT I- OVERVIEW OF IMMUNOSYSTEM

Introduction of Immunology, Histroy, Types of Immunity: Innate Immunity, Adaptive Immunity(B-lymphocyte,T-lymphocyte), Comparative Immunity

UNIT II- IMMUNE RESPONSE TO INFECTION DISEASE

Viral Infection, Bacterial Infection, Protozone Disease, Disease cause by parasitic warms, Emerging infection disease.

UNIT III- HYPERSESITIVITY REACTION

Introduction of Hypersesitivity, IgM-Mediated Hypersesitivity, Antibody Mediated Cytotoxic Hypersesitivity, Gell and Combs Classification

UNIT IV-VACCINES

Designing Vaccines for active immunization, whole –organism vaccine, purified macromolecules vs vaccine, Recombinant vector vaccine,DNA vaccines, multivalent subunit vaccines

UNIT V- TRANPLANTATION IMMUNOLOGY

Clinical transplantation , Immunologic basis of Graft Rejection, Clinical manifestation of graft rejection, General immunosuppressive therapy, Specific immunosuppressive therapy

Reference Books

1. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kubyís Immunology. 6th edition W.H. Freeman and Company, New York.
2. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication
3. Cellular & Molecular Immunology, 7th Edition, Abul K. Abbas & Andrew H. Lichtman & Shiv Pillai, 2011

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100			
	MSE	CA	Total Marks

Internal Assessment	(Unit test)	Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8

2.	80-90	8-9
3.	90-100	9-10

INSRUMENTATION IN BIOTECHNOLOGY

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B.Tech. Biotechnology

Course Unit Title: Insrumentation in biotechnology **Course Code**- BTB-235

Credits- 4+0 (2Theory) **Credits allocated:** 4+0 (Theory)

Level of Study: UG

Mode of delivery planned learning activities and teaching method: Lecture 3 hrs/weekly

Recommended Year /Semester: B.Tech. Biotechnology Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective:

3. To develop an understanding of basics use of instruments
4. To understand about the handling of instruments

Learning Outcomes:

3. Use knowledge of instrument handle
4. Understand the working properties of instruments

COURSE CONTENTS

THEORY

UNIT I: MICROSCOPIC TECHNIQUES

Properties of light , spectrum of light ,Numerical aperture, types of lenses, magnification through a lense, Resolution power of a lense Theory Principle

APPLICATION OF –Light microscopy, Bright field microscopy , Dark field microscopy, Phase contrast microscopy, Fluoresense microscopy, NIDC microscopy, Confocal microscopy, SEM microscopy, TEM microscopy, STEM microscopy

UNIT II SEPARATION TECHNIQUES

CHROMATOGRAPHIC TECNIQUES: Theory and principle of chromatography techniques. Application of:- Paper Chromatography, Thin layer Chromatography, Gel filtration Chromatography, Ion exchange Chromatography, Affinity Chromatography, Reverse phase Chromatography, Gas-Liquid Chromatography, HPLC (High performance liquid Chromatography)

ELECTROPHORETIC TECHNIQUES

Basic Principle & Theory of electrophoresis techniques, Application of electrophoresis techniques. Types of Electrophoresis: Agarose Gel electrophoresis ,Paper electrophoresis, Starch gel, Native and denaturating PAGE and Isoelectric focusing, 2D electrophoresis.

UNIT III: CENTRIFUGATION

Centrifugation, Types of Centrifugation; Preparative and Analytical Centrifuge, Differential Centrifuge, Sedimentation velocity, Sedimentation equilibrium, Density gradient, Methods and their application.

UNIT IV: BIOPHYSICAL METHODES AND ELECTROPYSIOLOGICAL METHOD

BIOPHYSICAL METHOD, Analysis of biomolecules using UV-visible, IR-Raman ,Fluorescence, NMR, CD-ORD, ESR, Analysis using light scattering, Different types of mass spectrometry and surface plasma resonance methods.

ELECTROPHYSIOLOGICAL METHOD

Principle, Medical Applications of,Single neurone recording, Patch clamp recording, ECG, Brain activity recording, Pharmacological Testing(PET ,MRI fMRI)

UNIT V: RADIO LABELING TECHNIQUES

Properties of different types of radio isotopes used in biology, Detection and Measurement of Radioactivity using Ionization Chamber, Proportional counter Geiger-Muller and scintillation Counter, Incorporation of radioisotopes in biological tissues and cells, Autoradiography and its application

Reference

1. David Friefeider: physical biochemistry –w.h. freeman and company
2. Nath and Upadyay: Biophysical chemistry-himalaya
3. Gudeep and Chatwal : Instrumental metho of chemical - himalaya

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

SEMINAR

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Title: Seminar **Course Code**- BBL-237

Credits- 0+1 (1 Practical) **Level of Study:** UG

Total Hours:

Mode of delivery planned learning activities and teaching method: Lecture 1 hrs/weekly

Recommended Year /Semester: B. Tech- Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: To encourage students to explore the connection between university study and life enrichment, lifelong learning, and civic responsibility. To promote respect for diversity issues and concepts.

Learning Outcomes: Improve your presentation and communication skills.

Get feedback on an early version of your latest work.

Engage in high-level debates and refine your ideas

Hear about the latest research

COURSE CONTENTS

THEORY

1. Seminar on topic of interest from course
2. Seminar document preparation
3. Presentation

SEMINAR ASSESMENT (Marks distribution): 50

Seminar Topic	Understanding of Subject	Presentation	Attendance	Total Marks
05	05	05	05	20
External Assessment:				30
Total Marks				50

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below. (Equal weightage of percentage to marks is given)

Sr. No	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

BIO.COMPUTATIONAL LAB

University- MGM University, AURANGABAD **Faculty**- Engineering and Technology

Institute Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code-BBL-127 **Course Title**- Bio Computational Lab

Credits- 1+0 **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 6 hrs/weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective and Outcome: To understand the classification & nomenclature of enzymes and the factors effecting enzymatic reaction. The students will be able to identify the cellular and molecular basis of immune responsiveness. The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

COURSE CONTENTS

Practical

1. Paper chromatography of amino acid – Asending and Desending method
2. Separation of sugars by chromatography
3. TLC of lipids and sugars .
4. RNA Electrophoresis
5. DNA Electrophoresis
6. Immunoelectrophoresis
7. To study mutation induced by UV radiation
8. To study temporary squash of onion root tip for study of Mitosis
9. To study Capsule staining
10. To study Endospore staining
11. To study flagella staining
12. To study Growth curve of bacteria
13. To study effect of temperature on microbial growth

14. To study effect of pH on microbial growth
15. To study Growth curve of bacteria
16. To study effect of temperature on microbial growth
17. To study effect of pH on microbial growth

Practical Assessment

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

GENETICS LAB

University- MGM University, AURANGABAD **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code-BBL 239 **Course Title** – Genetic lab

Credits-0+1 **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 6 hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective and Outcome: To understand the classification & nomenclature of enzymes and the factors effecting enzymatic reaction. The students will be able to identify the cellular and molecular basis of immune responsiveness. The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

COURSE CONTENTS

Practical

1)Isolation of microorgamisms

2)Study of mycorrhizal association

3)Mapping of plant diversity

4) Study of plant plant interactions

5) Qualitative test for carbohadrates

6) Estimation of reducing sugar

7) Estimation the presence of ascorbic acid

8)Isolation of citrous sugar cholesterol and lecithin from egg yolk

9) To study one factor cross

10) To study two facter cross

11)To study three facter cross

12)To study U.V induced mutagenesis

13)To study U.V.survival curve.

14)To study chemical induced mutagenesis

15)To study survival curve with chemical mutagen

16) To study the spontaneous mutation in E.coli by fluctuation test

17) Isolation of plasmid DNA

18) To study pedigree analysis

19) Melting temperature of DNA by wallaze method

20) Melting temperature of DNA by visible spectrophotometer.

Practical Assessment

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be

better placed to perform well in a practical exam if they can report their methodology and observations accurately.

MINI PROJECT

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree** B.Tech. Biotechnology **Course Code**-BBL-230 **Course Title**- Mini project

Credits-0+1 **Level of Study: UG**

Mode of delivery planned learning activities and teaching method: Practical 6 hrs / weekly

Recommended Year /Semester: B. Tech.. Biotechnology, Year 2/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective- Students will get familiar to the topic in detail. They will have hands on different instruments. They will develop technical handling skills.

Learning outcomes- Students will gain knowledge about need of research in particular field and the idea development of how the lacuna can be erased that can be of social benefit.

COURSE CONTENTS

Practical

5. Synopsis Writing
6. Project work
7. Thesis Writing
8. Presentation

Project Assessment:

Idea of Project	**Understanding of Subject**	**Literature survey**	**Attendance**	**Total Marks**
5	5	5	5	20
External Assessment				30
Total Marks				50

Ideas of project:

Defining projects ideas is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management.

Literature survey:

A literature review establishes familiarity with and understanding of current research in a particular field before carrying out a new investigation. Conducting a literature review should enable you to find out what research has already been done and identify what is unknown within your topic.

Attendance:

In ongoing semester attendance are important for students. They are expected to do their project in the semester that is timetabled. The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

Project External Assessment (Marks distribution):30

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	05	05	05	10	05	30
Total marks						50

Environmental Studies

University: MGM University, Aurangabad
Faculty: Engineering and Technology
Institute: Institute of Biosciences and Tech.
Degree: B.Tech. Biotechnology
Course Unit Code: UNC-01
Course Title: Environmental Studies
Credits allocated: Audit
Level of Study: UG
Total Hours: 160 hrs
Mode of delivery, planned learning activities and teaching method: Practical 3 hrs / weekly
Recommended Year /Semester: B. Tech**.** Biotechnology, Year II/ Semester III

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Course Outcome

Students will Gain knowledge about environment

Course Objective

Students will able to understand about environmental studies

Unit I: Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit II: Natural Resources :

Renewable and non-renewable resources : Natural resources and associated problems. a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role

of an individual in conservation of natural resources. • Equitable use of resoureces for sustainable lifestyles.

Unit III: Ecosystems

• Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem :- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit IV: Biodiversity and its conservation

• Introduction – Definition : genetic, species and ecosystem diversity. • Biogeographical classification of India • Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels. • Inida as a mega-diversity nation V • Hot-sports of biodiversity. • Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit V: Environmental Pollution

Definition • Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards • Solid waste Management : Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. • Pollution case studies. • Diaster management : floods, earthquake, cyclone and landslides.

Unit VI: Social Issues and the Environment

• From Unsustainable to Sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rahabilitation of people; its problems and concerns. Case Studies • Environmental ethics : Issues and possible solutions. • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. • Wasteland reclamation. • Consumerism and waste products. • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water

(Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Issues involved in enforcement of environmental legislation. • Public awareness.

Unit VII: Human Population and the Environment

• Population growth, variation among nations. • Population explosion – Family Welfare Programme. VII • Environment and human health. • Human Rights. • Value Education. • HIV/AIDS. • Women and Child Welfare. • Role of Information Technology in Environment and human health. • Case Studies.

Unit VIII: Field work

• Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural • Study of common plants, insects, birds. • Study of simple ecosystems-pond, river, hill slopes

Refrerences

a) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

b) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)

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d) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

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i) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)

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k) Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.

l) Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.

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p) Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.

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r) Survey of the Environment, The Hindu (M)

s) Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

Assessment Method:

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 50				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	10	5	5	20
External Assessment: Semester End Theory Examination				30
Total Marks				50

Internal Assessment (Marks conduction): 20

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	10

- Short Notes (any 2) out of 3 Marks-8
- 4 MCQs Marks-2

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

MGM UNIVERSITY, AURANGABAD

INSTITUTE of BIOSCIENCES AND TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

w. e. f. Academic Year 2021-22

Faculty of Engineering and Technology

Graduate (UG) Program

B.Tech. (UG)

B. TECH BIOTECHNOLOGY- CURRICULUM

w. e. f. Academic Year 2022-23

B. TECH BIOTECHNOLOGY

SECOND YEAR

SEMESTER-IV

CURRICULUM

Detail Course Layout with course content

2nd Year IV Semester

BTB-241	Numerical and Computational Fundamentals III	4+0
BTB-242	Genomics and Proteomics	4+0
BTB-243	Introduction to Fermentation Technology	4+0
BTB-244	Principles of Developmental Biology	4+0
BBL-245	Recombinant DNA Technology	4+0
BBL-247	Seminar (Subject Base Seminar)	0+1
BBL-248	Bio-Computational Lab	0+1
BBL-249	Indus Lab	0+1
BBL-240	Mini Project	0+1
BTB-246	Open Elective	Audit

Semester IV																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 241	Numerical And Computational Fundamentals-III	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 242	Genomics And Proteomics	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 243	Introduction to Fermentation Technology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 244	Principles of Developmental Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 245	Recombinant DNA Technology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-247	Seminar (Subject Base Seminar)	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-248	Bio-Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-249	Indus Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-240	Mini Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BTB 246	Open Elective	Theory	2	-	-	10	10	-	30	-	50	-	-	-	12	-	20	Audit
	Total		**15**	**5**	**8**	**100**	**100**	**80**	**300**	**120**	**750**	**0**	**0**	**32**	**120**	**48**	**280**	**24**

Numerical And Computational Fundamentals-III

University: MGM University, Aurangabad

Faculty: Basic and Applied Science

Institute: Institute of Biosciences and Technology.

Degree: B. Tech Biotechnology (UG)

Course Unit Code: BTB 241

Course Title: Numerical And Computational Fundamentals-III

Credits allocated: 4+0

Level of Study: UG

Recommended Year /Semester: B. Tech Biotechnology Year 2/ Semester IV

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

COURSE CONTENTS

THEORY

UNIT –I: PRELIMINARIES OF COMPUTING.

Basic Concepts : Round Off errors, Floating Point Arithmetic, Convergence.

UNIT –II: NUMERICAL SOLUTION OF NONLINEAR EQUATIONS

Bisection method, fixed- point iteration, Newton's method. Error analysis for Interative Methods. Computing roots of polynomials.

UNIT – III: INTERPOLATION AND POLYNOMIAL APPROXIMATION

Lagrance polynomial

Divided Differences

Hermite Interpolation

UNIT- IV: NUMERICLA INTEGRATION AND DIFFERENTIATION

Trapezoidal rules, etc., Gaussian quadrature and Euler-Maclaurin formula.

UNIT –V: APPLIED LINEAR ALGEBRA

Direct methods for solving linear systems, numerialfactorizations.

Eigenvalue problems.

- **REFERENCES-**

1. J.Store and R. Bulirsch, Introduction to Numerical Analysis , Soringer-Verlage, L.N. Trefethen and D. Bau.
2. Numerical Linear Algebra, Society of Industrial and Applied Mathematics.
3. C.T. Kelley, Interative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Genomics & Proteomics

University: MGM University, Aurangabad
Faculty: Engineering and Tech.
Institute: Institute of Biosciences and Technology.
Degree: B. Tech Biotechnology
Course Unit Code: BTB 242
Course Title: Genomics And Proteomics
Credits allocated: 4+0
Level of Study: UG
Recommended Year /Semester: B. Tech Biotechnology Year 2/ Semester IV

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective-

1. Explain principles of basic methods of genomic and proteomic analysis.
2. To propose appropriate methods for analysis of given sample type with respect to purpose of analysis.

COURSE CONTENTS

THEORY

Unit I: Introduction to Genomics and Proteomics:

Introduction – Organization and structure of genomes, Genome size, Sequence complexity, Introns and Exons, Genome structure in viruses and prokaryotes,C-value paradox. Isolation of Chromosomes, chromosome micro dissection, Retrofitting. Introduction to Proteomics – The Proteome, Mining proteomes, Bridging Genomics and Proteomics.

UNIT II: Gene Identification and Expression:

Genome annotation, traditional routes of gene identification, detecting open-reading Frames, software programs for finding genes, Identifying the function of a new gene, gene ontology, overview of comparative genomics, Protein structural genomics, determining gene function by sequence comparison and through conserved protein structure Global expression profiling –

Introduction, traditional approaches to expression profiling, Analysis of RNA expression, applications of genome analysis and genomics.

UNIT III: Analysis of Proteomes :

Analysis of proteomes - Two-dimensional polyacrylamide gel electrophoresis, Sample Preparation, Solubilization, Reduction, Resolution, Reproducibility of 2-DE Detecting proteins in polyacrylamide gels, Image analysis of 2-DE gels. Mass spectrometry based methods for protein identification- De novo sequencing

UNIT IV: Applications of Genomics and Proteomics Analysis:

Analysis of Genomes – Human, Mouse, *Plasmodium falsiparum, Saccharomyces cerevisiae, Mycobacterium tuberculosis.* Application of proteome analysis- drug development and toxicology, Pharmaceutical Applications, Proteomics in drug Discovery in human, phage antibodies as tools, Glycobiology and Proteomics in plant genetics and breeding.

UNIT V: Genomics:

Genome projects: The Human genome project, HapMap Project,genome and ENCODE Project.

Structural genomics: Assembly of a contiguous DNA sequence- shotgun method, clone contig

method, and whole –genome shotgun sequencing Understanding a genome sequence: locating the genes in a genome sequence, determining the functions of individual genes and by studying the activity of a protein coded of an unknown gene.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

<table>
<tr><td colspan="4">Theory Assessment (Marks distribution): 100</td></tr>
<tr><td rowspan="2">Internal Assessment</td><td rowspan="2">MSE (Unit test)</td><td colspan="2">CA</td><td rowspan="2">Total Marks</td></tr>
<tr><td>Attendance record</td><td>Home Assignment</td></tr>
</table>

	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Introduction to Fermentation Technology

University: MGM University, Aurangabad

Faculty: Engineering and Technology

Institute: Institute of Biosciences 7 Tech.

Degree: B. Tech Biotechnology (UG)

Course Unit Code: BTB 243

Course Title: Introduction to Fermentation Technology

Credits allocated: 4+0

Level of Study: UG

Recommended Year /Semester: B. Tech Biotechnology Year 2/ Semester IV

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective-

To impact knowledge about biological and biochemical technology, with a focus on biological products, the design and operation of industrial practices.

COURSE CONTENTS

THEORY

Unit I : Introduction to fermentation technology.

History of fermentation industry ; General requirement of fermentation process. Isolation ,preservation and improvement of industrially important microorganisms.

Unit-II : Media formulation

Microbial culture selection for fermentation process .Media formulation ,oxygen requirement,media optimization media sterilization.Batch-culture ,fed batch culture and continuouse culture.Application and examples of antifoam.

Unit-III: Design of Bioreactors

Fermenter designs ,agitator and sparger ,baffles,stirrer glands and bearing ,process parameters and measurement of temperature,pressure and pH,DO,foametc.Valve and steamtraps.

Unit-IV:Inoculum Development

Criteria for the transfer of inoculums,the development of inocula for yeast process , development of inocula for bacteria process. development of inocula for mycelial process,the aseptic inoculation of plant fermentor.

Unit-V:- Recovery and purification of fermentation

Removal of microbial cells,Foam separation,precipitation filtation ,centrifugation ,cell disruption ,liquid-liquid extraction,Drying,crystalization

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks

1	20

- Short Notes (any 3) out of 4 Marks-15
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II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Principle of Developmental Biology

University: MGM University, Aurangabad

Faculty: Engineering and Technology

Institute: Institute of Biosciences and Technology.

Degree: B. Tech Biotechnology

Course Unit Code: BTB 244

Course Title: Principle of Developmental Biology

Credits allocated: 4+0

Level of Study: UG

Recommended Year /Semester: B. Tech Biotechnology Year 2/ Semester IV

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective: Developmental biology studies the mechanisms involved in the development of complex organisms from the moment the egg is fertilized by a sperm.

COURSE CONTENTS

THEORY

Unit I : Developmental Biology an overview

Introduction of animal development: Development among unicellular eukaryotes – Acetabularis, Naegleria. The origins of sexual reproduction. Fertilization: structure of gamets: sperm and egg , recognition of sperm and egg,Sperm attraction –action at distance and contact of gametes. Acrosome reaction.

Unit II: Early Embryonic Development

Gametogenesis, Fertilization, Embryo sac development and double fertilization in plants, blastula formation, Types of Cleavage, Gastrulation and formation of germ layers in animals.

Unit III: Morphogenesis and organogenesis in animals

Cell aggregation and differential in Dictyostelium; axes and pattern formation in Drosophila, organogesis –vulva formation in Caenorhabditis elegans; eye lens induction, limb development in vetebrates, neuron differentiation, -larval formation, metamorphosis; environmental regulation of normal developopment.

Unit IV: Extra embryonic membrane

Cell death and regeneration.Study of extra-embryonic membrane in chick, concept of regeneration programmed cell death and aging and senescence

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Recombinant DNA Technology

University: MGM University, Aurangabad
Faculty: Engineering and Technology
Institute: Institute of Biosciences and Technology.
Degree: B. Tech Biotechnology
Course Unit Code: BTB 245
course Title: Recombinant DNA Technology

Credits allocated: 4+0
Level of Study: UG

Recommended Year /Semester: B. Tech Biotechnology Year 2/ Semester IV

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objectives:

1. Methods for selection of recombinants and analysis of cloned genes by sequencing methods.
2. Acquire skills on techniques of construction of recombinant DNA - Cloning vectors and isolation of gene of interest**.**

COURSE CONTENTS

THEORY

Unit I: Introduction to biotechnology and basic DNA cloning

Milestones in genetic engineering and biotechnology. Simple cloning of DNA fragments, Vectors: Definition and properties.. Transformation of DNA by chemical method and electroporation.

Unit-II:Restriction Enzymes:

Types and uses of restriction endonuclease, classification Restriction mapping. DNA modifying enzymes: Nucleases, Polymerases, Phosphatases and ligases.

Unit III: Tools of recombinant DNA technology

Hosts and enzymes: *Agrobacterium*-mediated delivery *E. coli* strains; Yeast (*Saccharomyces cerevisiae*, *Pichia pastoris*); Fungi (*Penicillium*, *Aspergillus*); Mammalian cell lines – names and genotypes. Restriction modification systems: Types I, II and III. Mode of action, nomenclature. Application of Type II restriction enzymes in genetic engineering. DNA modifying enzymes and their applications

Unit IV: Vectors

Cloning Vectors- Definition and Properties. Plasmid vectors-pBR and pUC series, Bacteriophage lambda and M13 based vectors. Cosmids. Shuttle vectors. BACs, YACs, MACs.terminal deoxynucleotidyl transferase, kinases and phosphatases, DNA ligases and DNA polymerases, reverse transcriptases, bacteriophage RNA polymerases, exonuclease III, BAL31, mung bean nuclease, S1 nuclease. *Mammalian Expression Vectors*- SV40, Vaccinia, Retroviral promoter based vectors.

Unit V: Principal and applications in analysis of recombinants:

Principle of hybridization. Northern blotting, Southern blotting, Western blotting. Polymerase chain reaction, selection and screening of recombinants, Restriction fragments length polymorphism, RAPD, AFLP, MAP.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

<table>
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<tr><td colspan="4">External Assessment: Semester End Theory Examination</td><td>60</td></tr>
<tr><td colspan="4">Total Marks</td><td>100</td></tr>
</table>

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

SEMINAR

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Unit Title: Seminar **Course Code**- BBL-247

Credits- 0+1 (practical) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology (UG) Year 2/ Semester IV

COURSE CONTENTS

THEORY

1. Seminar on topic of interest from course
2. Seminar document
3. Presentatio

Seminar Topic	Understanding of Subject	Presentation	Attendance	Total Marks
05	05	05	05	20
External Assessment:				30
Total Marks				50

SEMINAR ASSESMENT (Marks distribution): 50

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below. (Equal weightage of percentage to marks is given)

Sr. No	Percentage of attendance	Marks
5.	70	2
6.	80	3
7.	90	4

8.	100	5

Bio-Computational Lab

University- MGM University, Aurangabad **Faculty-** Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree** B. Tech-BioTechnology

Course Code-BBL-248 **Course Title**-Bio-Computational Lab

Credits-0+1 **Level of Study: UG**

Recommended Year /Semester: B. Tech. Biotechnology, Year 2/ Semester IV

Practical List:

1. Solving nonlinear equations f (x) = 0.
2. Solving large systems of linear equations.
3. Solving systems of nonlinear equations.
4. Finding efficient and effective approximations of functions.
5. Fitting curves to data by a variety of methods.
6. Finding derivatives of any order for functions even when the function is known only as a table of values.
7. Integrating any function even when known only as a table of values.
8. Solving differential equations.
9. Differentiate the following expressions (with respect to x):
    1. $(8x+7)ex$
    2. $\ln(6x2+2x+5)$
    3. $\sin(-5x2-8x+2)$
    4. $(-7x2-5x)\cos x$
    5. $ex2-8x+7$
    6. $(4x2-3x-7)\ln x$
10. Integrate the following expressions (with respect to x)
    1. $\sin x \ln(\cos x)$
    2. $2x1+x2-----\sqrt{}$

3. $e\cos x \sin x$
4. $x2\sin x$
5. $ex\cos x$
6. $(x+9)3$

Practical Assessment for 50 marks

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva-** Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be

better placed to perform well in a practical exam if they can report their methodology and observations accurately.

Industrial lab

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree** B. Tech-BioTechnology

Course Code-BBL-249 **Course Title**-Indus Lab

Credits-0+1 **Level of Study: UG**

Recommended Year /Semester: B. Tech. Biotechnology, Year 2/ Semester IV

Objectives:

This course introduces various aspects of applied and industrial microbiology. The course helps the students to learn every important upstream and downstream components of fermentation process including strain selection, development, media design, formulation and recovery of products. Additionally, the course can educate the students about fermenter design, different types of fermentations and also the current trend of fermentation process in biotech-industry. Overall, the course helps in the student's exposure on industrial applications of bioprocesses.

Industrial lab :

Fermentation technology

1. Isolation of industrial important microorganisms.
2. Identification of microbes by various staining method.
3. IMViC test for *E. Coli*.
4. Carbohydrate fermentation test.
5. Catalase test.
6. Urease test.
7. Hydrogen sulfide production test.
8. Oxidase test
9. Production of red and white wine from grapes.
10. Production of citric acid using *A. Niger*.

11. Characterization of citric acid.
12. Isolation of amylase producing bacteria from soil.
13. Production of Amylase.
14. Ethanol production using various Organic wastes or raw materials.
15. Production of bread and yoghurt.
16. Production of cheese.
17. Screening of antibiotic producing microorganisms from soil.
18. Production of penicillin.

Development Biology:

1. Study of cleavage process.
2. To prepare Drosophila culture media.
3. Establishment of Drosophila culture.
4. Identification of male and female drosophila

Recominant DNA Technology:

1. Isolation of Bacterial genomic DNA
2. Restriction enzyme digestion of pUC18 DNA
3. Purification of digested DNA by column purification
4. Ligation of DNA fragment with cloning vector
5. Preparation of Competent cells
6. Transformation in E.coli with recombinant vector
7. Polymerase Chain Reaction
8. Southern Hybridization
9. DNA Finger printing

Practical Assessment for 50 marks

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva-** Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

MINIPROJECT

University- MGM University, Aurangabad **Faculty**- Engineering and Technology

Institute- Institute of Biosciences and Technology **Degree** B. Tech-BioTechnology

Course Code-BBL-240 **Course Title**- Mini project

Credits-0+1 **Level of Study: UG**

Mode of delivery planned learning activities and teaching method: Lecture 2 hrs/weekly

Recommended Year /Semester: B. Tech. Biotechnology, Year 2/ Semester IV

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective- Students will get familiar to the topic in detail. They will have hands on different instruments. They will develop technical handling skills.

Learning outcomes- Students will gain knowledge about need of research in particular field and the idea development of how the lacuna can be erased that can be of social benefit.

COURSE CONTENTS

Practical

1. Project work
2. Synopsis presentionj
3. Thesis Writing
4. Presentation

Project Assessment (50 Marks)

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
5	5	5	5	20
External Assessment				30
Total Marks				50

Ideas of project:

Defining projects ideas is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management.

Literature survey:

A literature review establishes familiarity with and understanding of current research in a particular field before carrying out a new investigation. Conducting a literature review should enable you to find out what research has already been done and identify what is unknown within your topic.

Attendance:

In ongoing semester attendance are important for students. They are expected to do their project in the semester that is timetabled. The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3

3.	90	4
4.	100	5

Project External Assessment (Marks distribution):30

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	05	05	05	10	05	30
Total marks						50

MGM UNIVERSITY, AURANGABAD

INSTITUTE OF BIOSCIENCES AND TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Sciences

Graduate (UG) progrmme

B.Tech .Biotechnology - CURRICULUM

w. e. f. Academic Year 2021-22

B.Tech Biotechnology

THIRD YEAR

SEMESTER-V

CURRICULUM

B.Tech Biotechnology Third year-V Sem

BTB 351	Numerical And Computational Fundamentals-IV	4
BTB 352	Plant Tissue Engineering	4
BTB 353	Cell Signalling	4
BTB 354	Stem Cell Biology	4
BBL-356	Seminar (Subject Base Seminar)	1
BBL-357	Computational Lab	1
BBL-358	Plant Lab	1
BBL-359	Mini Project	1
BTB-350	Foregin Language	2

Semester V																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 351	Numerical And Computational Fundamentals-IV	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 352	Plant Tissue Engineering	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 353	Cell Signalling	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 354	Stem Cell Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-356	Seminar (Subject Base Seminar)	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-357	Computational Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-358	Plant Lab	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BBL-359	Mini Project	Practical	-	-	2			20		30	50	-	-	8		12	20	1
BTB-350	Foregin Language	Theory	2	-	-	10	10	-	30	-	50	-	-	-	12	-	20	2
	Total		**14**	**4**	**8**	**90**	**90**	**80**	**270**	**120**	**650**	**0**	**0**	**32**	**108**	**48**	**260**	**22**

Numerical and Computational Fundamentals- IV

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree**: B. Tech Biotechnology

Course Code- BTB-351 **Course Title:** Numerical and Computational Fundamentals- IV

Credits- 4+0 (4Theory) **Level of Study:** UG

Recommended Year /Semester: B. Tech Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

1. To acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
2. To learn the concepts of vector calculus needed for problems in all engineering disciplines.
3. To develop an understanding of the standard techniques of complex variable theory.
4. To enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
5. To understand the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

Learning Outcomes:

1. To make the student acquire sound knowledge of techniques in solving ordinary differentialequations that model engineering problems.
2. To have an ability of mathematical modeling of systems using differential equations and ability to solve the differential equations. To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
3. To use Stokes' theorem, Green's theorem and Gauss divergence an to give a physical interpretation of the curl of a vector field.
4. To introduce the basics of analytic functions and the basics in complex integration this is used to evaluate complicated real integral

5. Evaluate real and complex integrals using the Cauchy integral formula and the residue Theorem.
6. To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
7. To introduce the concepts of Laplace Transforms and its applications to various problems related to engineering and technology.
8. To be able to find time responses of linear systems using Laplace transforms.
9. To apply partial fraction expansion to simplify a transform function for inverse Laplace transformation. To apply Laplace Transform methods to solve initial value problems for constant coefficient linear ODEs.

COURSE CONTENTS

THEORY

UNIT I- Ordinary Differential Equations

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II- Vector Calculus

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallel pipeds.

UNIT III -Analytic Functions

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV- Complex Integration

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V- Laplace Transform

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications ,Delhi,43rd Edition, 2013. 2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,6th reprint, 2008.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition, 2011. 2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education ,3rd Edition, 2012. 3. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House ,4th Edition,2014

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

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<tr><td>Attendance record</td><td>Home Assignment</td></tr>
<tr><td></td><td>20</td><td>10</td><td>10</td><td>40</td></tr>
<tr><td colspan="4">External Assessment: Semester End Theory Examination</td><td>60</td></tr>
<tr><td colspan="4">Total Marks</td><td>100</td></tr>
</table>

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Plant Tissue Engineering

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BTB-352 **Course Title:** Plant Tissue Engineering

Credits- 4+0 (4Theory) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

1. Comprehend and describe various protocols of plant cell, tissue, and organ culture as well as the scientific principles underlying the protocols
2. To apply plant tissue culture technology for clonal propagation, assisting plant breeding and plant improvement, recovering plants from transformed cells, and production of valuable plant biochemical .
3. Explain and demonstrate various protocols of plant gene transfer technology.
4. Describe the underlying principles of each step of the plant gene transfer protocols.
5. Describe the methods and principals for the validation of transgene integration into plant genome.

Learning Outcomes:

1. Learning important milestones in the plant tissue culture.
2. Understanding the concepts and principles of Plant tissue culture.
3. Learning the techniques of sterilization and monitoring method of sterilization.
4. Learning different pathways of plant regeneration under in vitro conditions - organogenesis and somatic embryogenesis.
5. Techniques of establishing cell suspension culture. Synthetic seeds and applications.
6. Protoplast isolation, culture and protoplast fusion - applications -. Somaclonal variation - applications.

COURSE CONTENTS

THEORY

UNIT I- Plant genomes and plant tissue culture

Introduction-gene structure and genome size and organization, Brief history of plant tissue culture, Scope of plant tissue culture, Equipments in Tissue Culture Laboratory, Preparation media, Media Composition, Selection of explants, Sterilization, Sterilizing agent, nutrient and hormone requirement, mode of action of auxin and cytokinin. Plant tissue culture plasticity and totipotency

UNIT II- Types of tissue culture

Criteria of cell selection, factor affecting the culture of cells. Cell, Callus & Suspension cultures. Somatic Embryogenesis and Hybridization. Haploid Production through Anther and ovule culture; Embryo culture.

UNIT III- In-vitro mutagenesis and germplasm Conservation

Somaclonal variation; In vitro mutation methods; Micro propagation somatic hybrid and cybrid, Plant regeneration. Germ plasma conservation, production of secondary metabolites; Sources of plant secondary metabolite

UNIT IV-

Biotransformation: Gene constructs, Vectors for the production of transgenic plants, Introduction- Agro bacterium mediated gene transfer –Ti-plasmid-process of T-DNA transfer and integration, transformation in plant, Direct and indirect gene transfer methods. Binary vectors-basic features of vectors-optimization-clean gene technology.

Plant molecular biology: Genome organization in prokaryotes and eukaryotes. Transcription and post-transcriptional regulation. Translation and post-translational process. Molecular basis of mutations.

UNIT V-

Transgenic Plants: Herbicide and Pest resistance, Herbicide resistance-use of herbicide in modern agriculture strategies for engineering herbicide resistance environment impact, pest resistance-nature and scale of insect/pest damage to crop. GM strategies-Bt approach to insect resistance-copy nature strategy-insect resistant crops and food safety.

Molecular farming: Introduction –carbohydrates and lipid production, molecular farming of proteins, economic considerations for molecular farming.GM crops- current status concerns about GM crops-regulations on GM crops and products, Greener genetic engineering.

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Cell Signaling

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BTB-353 **Course Title:** Cell Signaling

Credits- 4+0 (4Theory) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Learning Outcomes:

1. Understand the basic principles of signal transduction mechanisms, in particular the concepts of response specificity, signal amplitude and duration, signal integration and intracellular location
2. Give examples of different types of extracellular signals and receptors, and explain their functional significance
3. Describe the mechanisms by which different receptors may be activated by their respective ligands
4. Describe and give examples of the structure and properties of the major components of signal transduction pathways.

COURSE CONTENTS

THEORY

UNIT I- Introduction to Cell Signaling

Introduction-cell Signaling, Role of Signaling in Biological Processes, The Molecular Currencies of Information Processing, Linking Signaling Nodes into Pathways & Networks.

UNIT II- Principles & Mechanisms of Protein Introduction

Properties of Protein-Protein Introduction, Protein Interaction in their Cellular & Molecular context.

UNIT III- Signaling Enzymes and their Allosteric Regulation

Principles of Enzyme catalysis, Allosteric Conformation, Protein phosphorylation as a regulation Mechanism, protein kinases, protein phosphatases, G protein signaling, Regulatory Enzymes for G Protein Signaling, Signaling Enzyme Cascades.

UNIT IV- Post-Translational Modification in Signaling

Post-Translational Regulation, Addition of Ubiquitin & Related Protein, Histone Acetylation & Methylation

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Stem Cell Biology

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BTB-354 **Course Title:** Stem Cell Biology

Credits- 4+0 (4Theory) **Level of Study:** UG

Recommended Year /Semester: B. Tech Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.

To provide better familiarity with the Theoretical and Practical concepts of Transducers.

To provide familiarity with different sensors and their application in real life.

To provide the knowledge of various measurement methods of physical and electrical parameters

Learning Outcomes:

1. Describe the difference between embryonic, adult and induced pluripotent stem cells and how they differ from fully differentiated cells.

2. Describe the properties and use of stem cells.

3. Gain a knowledge of the intrinsic and extrinsic factors important for stem cell renewal and differentiation.

4. Understand the clinical significance of stem cell research and the possible problems that need to be overcome.

5. Could discuss the ethical issues associated with embryonic stem cells and stem cell therapy with a global bioethics perspective. (G)

COURSE CONTENTS

THEORY

UNIT I-Introduction to Stem Cell Biology

Definition- properties- Unique properties of stem cells- culture of stem cells-medical applications of stem cells - ethical and legal issues in use of stem cells.

UNIT II- Types of stem cells.

Stem Cell biology and therapy- types embryonic stem cell- Hematopoietic Stem Cells- Adult stem cell, Stem Cell Biology and Therapy- Embryonic Stem Cells – umbilical cord stem cells – similarities and differences between embryonic and adult stem cells. Properties of stem cells – pluripotency – totipotency culture and the potential benefits of stem cell technology

UNIT III- Therapeutic applications of stem cells

Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects, Genetic Perspectives for Gene Therapy, Gene Delivery methods: Viral vectors and Non-viral Vectors, Stem Cells and Diabetes, Stem Cells and cancer

UNIT IV- Ethical Issues associated with stem cell-based regenerative medicine field

Regulatory and Ethical Considerations of stem cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

UNIT V- Genetic Engineering:

– genetically engineered stem cells – stem cells and Animal cloning – transgenic animals and stem cells- tissue engineering application – production of complete organ - kidney – eyes - heart – brain.

Reference

1. Essentials of Stem Cell Biology, Second Edition, 2009, Edited by Robert Lanza, M.D., Page 1 of 6 ISBN: 978-0-12-374729-7, Elsevier Inc.

2. StemBook. Open-access collection of original, peer-reviewed chapters covering topics related to stem cell biology. Chapters required for class will be specified in the course schedule. StemBook can be accessed @ http://www.stembook.org

3. NIH Stem Cell Information Home Page. In Stem Cell Information [World Wide Web site]. Bethesda, MD: National Institutes of Health, U.S. Department of Health and Human Services. Available @ http://stemcells.nih.gov/Pages/Default.aspxSensors, Actuators, and Their Interfaces A multidisciplinary introduction 2nd Edition- Nathan Ida

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

Seminar (Subject Base Seminar)

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BBL-356 **Course Title:** Seminar

Credits- 0+1 (1 Practical) **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 1 hrs/weekly

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: To encourage students to explore the connection between university study and life enrichment, lifelong learning, and civic responsibility. To promote respect for diversity issues and concepts.

Learning Outcomes: Improve your presentation and communication skills.

Get feedback on an early version of your latest work.

Engage in high-level debates and refine your ideas

Hear about the latest research

COURSE CONTENTS

THEORY

1. Seminar on topic of interest from course
2. Seminar document preparation
3. Presentation

SEMINAR ASSESMENT (Marks distribution): 50

Seminar Topic	Understanding of Subject	Presentation	Attendance	Total Marks
05	05	05	05	20
External Assessment:				30
Total Marks				50

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below. (Equal weightage of percentage to marks is given)

Sr. No	Percentage of attendance	Marks
9.	70	2
10.	80	3
11.	90	4
12.	100	5

Computational Lab

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BBL-357 **Course Title:** Computational Lab

Credits- 0+1 (1 Practical) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Practical list:

1. Study of Introduction to MATLAB.
2. Study of basic matrix operations.
3. Program for scan conversion of a straight line.
4. Program for scan conversion of a circle.
5. Program for scan conversion of an ellipse.
6. Program for scan conversion of a rectangle.
7. Program for scan conversion of an arc.
8. Program To solve linear equation.
9. Program for finding roots of f(x)=0 by newton raphsonm method.
10. Program for finding roots of f(x)=0 by bisection method.
11. Program for solving numerical integration by simpson's 1/3 rule.

Practical Assessment:

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

Plant Lab

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BBL-358 **Course Title:** Plant Lab

Credits- 0+1 (1 Practical) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology, Year 3rd / Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Practical:

1. To study equipment in Plant tissue culture laboratory
2. Preparation of plant tissue culture media
3. Quantification of proteins from biological samples
4. Protein purification by dialysis method
5. To study Sodium Dodocyl sulphate method
6. To study enzyme inhibiton
7. To study application and lab arrangement in stem cell laboratory
8. To study plant plant onteraction
9. Isolation of protoplast
10. Callus induction and Plant Regeneration
11. Preparation of pluripotent stem cell culture medium
12. Preparation of collagenase solution
13. Gelatin coating of culture plate
14. To study Totipotent cell
15. To study Agrobacterium mediated transformation
16. Meristem Culture, Culture types: Anther Culture, Ovary culture.
17. Study of embryo and culture, micro propagation of Banana, somatic embryogenesis, artificial seeds through photographs
18. Protoplast fusion.

19. Somatic Embryogenesis :

    Direct Embryogenesis

    Indirect Embryogenesis

20. Callus formation, multiplication and organogenesis.

Practical Assessment:

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques Usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

MINI PROJECT

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BBL-359 **Course Title:** Mini Project

Credits- 0+1 (1 Practical) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: Students will get familiar to the topic in detail. They will have hands on different instruments. They will develop technical handling skills.

Learning outcomes: Students will gain knowledge about need of research in particular field and the idea development of how the lacuna can be erased that can be of social benefit.

COURSE CONTENTS

Practical

1. Synopsis
2. Project work
3. Thesis Writing
4. Presentation

Project Assessment (50 Marks)

Idea of Project	**Understanding of Subject**	**Literature survey**	**Attendance**	**Total Marks**
5	5	5	5	20
External Assessment				30
Total Marks				50

Ideas of project:

Defining projects ideas is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management.

Literature survey:

A literature review establishes familiarity with and understanding of current research in a particular field before carrying out a new investigation. Conducting a literature review should enable you to find out what research has already been done and identify what is unknown within your topic.

Attendance:

In ongoing semester attendance are important for students. They are expected to do their project in the semester that is timetabled. The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

Project External Assessment (Marks distribution):30

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	05	05	05	10	05	30
Total marks						50

Foreign language

University: MGM University, Aurangabad **Faculty:** Engineering and Technology

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BTB-350 **Course Title:** Foreign language

Credits- 0+1 (1 Practical) **Level of Study:** UG

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester V

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

The Course aims at imparting the German/ French language basic level skills to the aspirants.

Learning outcomes:

At the end of the Course The student is able to

- communicate daily needs like telling time, age, greetings, introduction etc
- to construct simple sentences with auxiliary verbs
- To listen and comprehend other speaker in day to day situations

COURSE CONTENTS

THEORY

German Language

Sr. No.	Lessons	Hrs
1	Alphabets	1
2	Pronunciation of Vowels	1
3	Vowel combination	1
4	Consonants	1
5	Consonants Combination	1
6	Numbers	2
7	Basic Mathematical Expressions	1

8	Days/Months Seasons	1
9	Telling Time	1
10	Telling Directions	1
11	Vocabulary Family	1
12	Talking about family	1
13	Weather	1
14	Food Vocabulary	1
15	Placing Order	1
16	Clothing vocabulary	1
17	Purchase of Clothing	1
18	Basic phrases like greetings	2

French Language

Sr. No.	Lessons	Hrs
1	Alphabets	1
2	Pronunciation of Vowels	1
3	Vowel combination	1
4	Consonants	1
5	Consonants Combination	1
6	Numbers	2
7	Basic Mathematical Expressions	1
8	Days/Months Seasons	1
9	Telling Time	1
10	Telling Directions	1
11	Vocabulary Family	1
12	Talking about family	1
13	Weather	1
14	Food Vocabulary	1
15	Placing Order	1

16	Clothing vocabulary	1
17	Purchase of Clothing	1
18	Basic phrases like greetings	2

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MGM UNIVERSITY, AURANGABAD

INSTITUTE of BIOSCIENCES AND TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

w. e. f. Academic Year 2021-22

Faculty of Engineering and Tech

Graduate (UG) progrmme

Biotechnology - CURRICULUM

B.Tech Biotechnology

SECOND YEAR

SEMESTER-VI

CURRICULUM

Semester VI																		
Course code*	**Course Title**	**Type**	**Teaching Scheme**			**Evaluation Scheme**						**Minimum Passing**						**Credit**
						Internal			**External**		**Total**	**Internal**			**External**		**Total**	
(Mandatory)			**L**	**T**	**P**	**CA**	**MSE**	**TW**	**ESE**	**PR**		**CA**	**MSE**	**TW**	**ESE**	**PR**		
BTB 361	Python	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 362	Animal Tissue Engineering	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 363	Molecular Cytogenetics	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BTB 364	Cancer Biology	Theory	3	1	-	20	20		60	-	100	-	-	-	24	-	40	4
BBL-365	Python Lab.	Practical			4			20	-	30	50	-	-	8		12	20	2
BBL-366	Animal Tissue Lab	Practical			4			20	-	30	50	-	-	8		12	20	2
BBL-367	Elective- 1-Pharmaceutical Microbiology 2- Enterprise Feasibility 3-Bioinformatics	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-368	Mini Project	Practical			2			20	-	30	50	-	-	8		12	20	1
BBL-369	Seminar (Research Paper Based)	Practical			2			20	-	30	50	-	-	8		12	20	1
	Total		**12**	**4**	**14**	**80**	**80**	**100**	**240**	**150**	**650**	**0**	**0**	**40**	**96**	**60**	**260**	**23**

PYTHON

University: MGM University, Aurangabad **Faculty:** Science (Science and Engineering)

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech-Biotechnology (UG)

Course Code- BTB-361 **Course Title:** Python

Credits- 4+0 (2Theory) **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 4 hrs/weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 3rd / Semester VI

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective:

When students complete Intro to Programming with Python, they will be able to: Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions. Work with user input to create fun and interactive programs.

.

Learning Outcomes:

1,To understand the structure of python programs

2.To understand the how computer program is compiled and executed

3.To learn how to write python classes

COURSE CONTENTS

THEORY

UNIT I –Data science

Python for data science, Introduction to statistics ,Types of statistics ,Analytics methodology and problem solving framework, populations and samples, Parameter and statistics, uses of variable: Dependant and independent variable, Types of variable: continuous and categorical variable

.

UNIT II – Machine learning with python

Introduction to machine learning, Basics of python ,Machine learning libraries, Regression: Assumptions of linear Regression, multiple regression, Model building and evaluation,Categorical data analysis,model building and scoring for prediction,Imbalanced data set

UNIT III – Artificial Intelligence

Introduction to AI ,Constraint satisfaction problems, Game trees: minimax ,probability ,Robotics/language/vision, Miscellaneous Topics, Reinforcement learning,Decision Diagrams/VPI

UNIT IV -Deep Learning and Image Recognition

Course introduction ,image classification, loss functions and optimization ,introduction to neural networks , convolutional neural networks, training neural networks part I and II

UNIT V –Tableau

Introduction to tableau desktop, Tableau desktop interface, Connecting data sources ,Organizing data, Analysis using Desktop

REFERENCE BOOKS:

1. Learning Python Powerful Object-Oriented Programming By Mark Lutz · 2013

2. Python For Bioinformatics By Sebastian Bassi, 2010 By Taylor And Francis Group, Llc

3. Bioinformatics Programming Using Python by Mitchell L Model

4. Basic Core Python Programming A Complete Reference Book to Master Python with Practical Applications By Meenu Kohli · 2021

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

ANIMAL TISSUE ENGINEERING

University- MGM University, AURANGABAD **Faculty**- Science (Biotechnology)
Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology
Course Code- BTB 362 **Course Title**- Animal Tissue Engineering
Credits- 4+0 (Theory) **Level of Study:UG**
Mode of delivery planned learning activities and teaching method: Lecture 4hrs / weekly
Recommended Year /Semester: B.Tech. Biotechnology, Year 3/ Semester VI

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Learning Outcomes: A distinctive feature of tissue engineering is to regenerate patient's own tissues and organs that are entirely free of poor biocompatibility and low biofunctionality as well as severe immune rejection. Owing to the outstanding advantages, tissue engineering is often considered as an ultimately ideal medical treatment

Objective: Animal cell culture enables studies related to cell metabolism and understand the biochemistry of cells. It also allows observation of the effects of various compounds like proteins and drugs on different cell types.

COURSE CONTENTS

THEORY

UNIT –I: BIOLOGY OF CELL DEVELOPMENT

•Cell differentiation into cell types and organization into specialized tissues; cell-ECM and cell-cell interactions; cell motility and migration;•Embryonic development stages [fertilisation, post fertilisation, Implantation]•Establishment of germ layers and their fate•Immune response to developing embryo

UNIT-II: ANIMAL CELL CULTURE

•Biology of cultured cells, Transformation, immortalisation,andDifferentiation•Primary Culture and development of cell lines –normal and tumor•Characterisationof cells in culture and maintenance of cells in culture: subculture, contamination,andcryopreservation•3-D culture: organ culture, histiotypicculture,andorganotypic culture

UNIT III: STEM CELLS AND TISSUE ENGINEERING

•Types of stem cells: ES, Adult, IPSCs, Cancer stem cells•Characterisationof stem cells •Applications of stem cells in therapeutics•Ethical issues and regulations in stem cell research•Fundamentals of tissue engineering: Growth Factors, morphogens, Extracellular Matrix, Cell adhesion and migration, Inflammatory and Immune responses to tissue engineered devices•Biomaterials: Polymeric scaffolds, Calcium Phosphate Ceramics, Biomimeticmaterials•Introduction of 3-D organ printing, organ on chip•Applications of tissue engineering

UNIT IV: **ADVANCES IN ANIMAL BIOTECHNOLOGY**

•Cell line models in biomedical research•Invitrotesting (cytotoxicity)•Scale up in cell culture (types of bioreactors for suspension and monolayer cultures and process control)•Therapeutic peptides/ BiosimilarsProductionmethodology oInsulinoTissue plasminogen activatoroInterferon – alpha,ErythropoietinoVaccinesoMonoclonal antibodies (Antibody engineering)•Animal models in biomedical research

References:

1. Lodish, Harvey F.; Berk, Arnold; Kaiser, Chris A. & Krieger, Monty: Molecular cell biology. (7th ed.) New York. W.H. Freeman and Company, 2013. 978-1-4641-0981-2--(574.87Lod)•Alberts, Bruce, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts,andPeter Walter: Molecular Biology of the cell (6thEd) Garland Science Publishing., 2015
2. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten. (2010) Molecular Biotechnology: Principles and Applications of Recombinant DNA. ASM Press.
3. Daan J. A. Crommelin, Robert D. Sindelar. (2002) Pharmaceutical Biotechnology: An Introduction for Pharmacists and Pharmaceutical Scientists. Taylor & Francis.•Gary Stein and Maria B et al. (2011) Human Stem Cell Technology and Biology. Wiley Blackwell.

4. GordanaVunjak-Novakovic, R. Ian Freshney. (2006) Cultureof Cells for Tissue Engineering. JohnWiley & Sons
5. .Inderbir Singh & GP Pal. (2007) Human Embryology. MacMillan Publishers.•Kaushik Deb and Satish Totey. (2009) Stem Cells Basics and Applications. Tata McGraw Hill.
6. R. Ian Freshney, Glyn N. Stacey, Jonathan M. Auerbach. (2007) Cultureof Human Stem Cells. JohnWiley & Sons
7. Robert Lanza, Robert Langer, Joseph P. Vacanti. (2011) Principles

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

University- MGM University, AURANGABAD **Faculty**- Science (Engineering & Technology)

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code- BTB 363 **Course Title**- Molecular Cytogenetics

Credits- 4+0 (Theory) **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 4hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 3/ Semester VI

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

The course is an introduction to molecular biology and genetics and methods used within these fields. The subject content is the following.

The structure of the genome: chromosomes, chromosomal structure, and extrachromosomal inheritance. The molecular basis of transmission of genetic information: nucleic acids and proteins. DNA replication, DNA repair, mutations, recombination, transposition, transcription, and translation. Examples of gene regulation.

Learning Outcomes:

After the course, the student should be able to:

- account for structure, formation and function of DNA, RNA and proteins
- describe the principles of gene regulation in prokaryotic and eukaryotic cells
- describe the consequences of different types of mutations and DNA-repair systems, recombination, restriction enzymes, operons and gene expression.
- use some and understand several modern molecular methods to elucidate molecular and genetic questions
- critically analyse, evaluate and compile results from laboratory exercises
- reason about ethical aspects of genetics.

COURSE CONTENTS

THEORY

UNIT-I Mutation

Basic features of mutation, Adaptation versus mutation, Phenotypic Effects of mutation, Molecular basis of gene mutation:, Mutationsinduced by chemicals,radiation ., Mutations caused by the DNA replication machinery,Hot spots of mutation, Detection of mutagens -The Ames Test, DNA repair mechanisms,Diseases resulting from defects in DNA repair mechanisms

Unit-II Somatic CellGenetics

Agents and mechanism of cell fusion, Heterokaryon –selection of hybrids and chromosome segregation,Radiation hybrid panels and gene mapping, Epigenetics:,Mechanisms of DNA Methylation, Methyl-CpG Recognition, Demethylation in Mammals, Mechanisms of Histone modifications,. Prions and Epigenetic Inheritance, Polycomb Mechanisms and Epigenetic Control of Gene Activity

Unit-III Genome Organization

Hierarchy in genome organization,Mobile DNA,Genetics of Cancer, Propertiesof cancer cells, Benign and malignant tumors , Metastasis, Relationship of cell cycle to cancer, Oncogenes, Tumor suppressor genes

Unit-IV Human Cytogenetic

Human karyotypes -banding –nomenclature, Dosage compensation,Numerical abnormalities of human chromosomes and related syndromes:Nondisjunction, Aneuploidy, Patau syndrome, Edwards syndrome, Down syndrome,Turner syndrome, Klinefelter syndrome, Structural abnormalities of human chromosomes and related syndromes:Deletion, Robertsonian translocation, Cri-du-chat syndrome, Prader -Willi syndrome,Williams syndrome, Wolf-Hirschhorn syndrome, Human metabolic disorders:Phenylketonuria, Lesch-Nyhan syndrome, Tay-Sachs disease, Alkaptonuria, Albinism, Congenital adrenal hyperplasia, Emphysemia, Glucose-6-phosphate Dehydrogenase deficiency, Achondroplasia, Other Genetic Diseases: Sicklecell anemia,Hemophilia, Thalassemia, Cystic Fibrosis, Huntington disease, Alzheimer's disease, Parkinson's disease

Unit-V Mitochondrial DNA and human diseases

Structure of mitochondrial DNA, Leber's Hereditary Optic Neuropathy (LHON), Myoclonic Epilepsy and Ragged Red Fiber Disease (MERRF), Pearson Marrow-Pancreas Syndrome (PMPS), Kearn-Sayre Syndrome, Mitochondrial Neurogastrointestinal Encephalomyopathy (MNGIE), . Sensorineural Hearing Loss ,Genetic Counseling: ,.Carrier detection, Fetal analysis (amniocentesis and chorionic villus sampling), Pedigree analysis

Refference book:

1. Principles of cytogenetics:K.P.S.MALIK
2. Introduction to cytogenetics :Ganesh prasad

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

CANCER BIOLOGY

University- MGM University, Aurangabad
Faculty- Science (Engineering & Technology)
Institute- Institute of Biosciences and Technology
Degree- B.Tech. Biotechnology
Course Code- BTB 364
Course Title- Cancer Biology
Credits- 4+0 (Theory)
Level of Study: UG
Mode of delivery planned learning activities and teaching method: Lecture 4hrs / weekly
Recommended Year /Semester: B.Tech. Biotechnology, Year 3/ Semester VI

Course Objective: Understand the genetic changes that give rise to cancer and the mechanisms by which those changes occur, as well as how genes are abnormally regulated (e.g., epigenetics) Research the biological processes underlying cancer initiation, progression, and metastasis.

Learning Outcomes: A more complete understanding of cancer cell biology will enable new prevention, detection, and treatment approaches that take advantage of vulnerabilities identified in cancer cells and their precancerous lesions.

COURSE CONTENTS

THEORY

Unit- Introduction to the course

Introduction to Cancer ,Proteins structure and function ,Background — Macromolecules , Lipids and cancer — lipid signaling ,Lipids and cancer — lipid metabolism ,Membrane components , Membrane trafficking in cancer ,Membrane trafficking

Unit-II Dysregulated vesicle trafficking systems in cancer cells

The Proteasome and cancer , Oncogenes and Cell Signaling ,G-protein coupled receptors in development of cancer and metastasis , Receptor tyrosine kinases

Unit-III Oncogenes

Tumor suppressors , Hormone signaling in cancer, Tumor Suppressors and the Cell Cycle ,Overview of the Cell Cycle

Unit-IV The retinoblastoma gene and cell cycle regulation

The DNA damage ,p53 and DNA damage ,BRC1, BRC2 and DNA damage ,Tumor Immunology,Cancer cell metabolism

Unit-V Treatment targeted therapy

Treatment- traditional chemotherapeutics ,Treatment- Immunotherapies , ,New Genomic and proteomic technologies Applications of new technologies in prevention, assessing risk, diagnostics, and treatment

Reference book: Textbook of cancer biology ,Dr.Pradip kumar

Assessment Method

Course Evaluation /Weightage: The relative weightage to the various examinations conducted, Unit test, Quiz, Home Assignment, Seminar and record maintained during a semester shall be as under both for Bachelors degree programmers.

Theory Assessment (Marks distribution): 100				
Internal Assessment	MSE (Unit test)	CA		Total Marks
		Attendance record	Home Assignment	
	20	10	10	40
External Assessment: Semester End Theory Examination				60
Total Marks				100

Internal Assessment (Marks conduction): 40

I. Unit Test Conduction:

In ongoing academic semester unit test are conducted to analyze students whether they are gaining theoretical knowledge, and also to keep them engaged in concerned subject continuously so as to better understand the subject develop interest in it.

No. of unit test	Total Marks
1	20

- Short Notes (any 3) out of 4 Marks-15
- 5 MCQs Marks-5

II. Home Assignment Conduction:

In ongoing academic semester home assignment are conducted to develop further in subject, more interest in subject and also to improve students writing skills necessary for scientific communication.

No. of Home Assignment	Total Marks
2	10

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	75-80	7-8
2.	80-90	8-9
3.	90-100	9-10

PYTHON LAB

University: MGM University, Aurangabad **Faculty:** Science (Engineering and Technology)

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BBL-365 **Course Title:** Python lab

Credits- 0+2 **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 3 hrs/weekly

Recommended Year /Semester: B. Tech- Biomedical Engineering, Year 3/ Semester VI

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective:

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To learn how to use lists, tuples, and dictionaries in Python programs.
4. To learn how to identify Python object types.
5. To learn how to use indexing and slicing to access data in Python programs.
6. To define the structure and components of a Python program.
7. To learn how to write loops and decision statements in Python.
8. To learn how to write functions and pass arguments in Python.
9. To learn how to build and package Python modules for reusability.
10. To learn how to read and write files in Python.
11. To learn how to design object-oriented programs with Python classes.
12. To learn how to use class inheritance in Python for reusability.
13. To learn how to use exception handling in Python applications for error handling.

Learning Outcomes: Students will have hands on Python language and can use it in research purpose

COURSE CONTENTS

Practical

Exp :1 To study basics of Macromolecules: DNA/RNA, Protein and there visualization. Exp

2: To study optimization methods like: -

a) Linear programming
b) Mixed integer programming
c) c)Nonlinear programming
d) Constraint programming

Exp 3: To study the use of spreadsheets for optimization modelling.

Exp 4: To study different programs used for Modelling with python.

Exp 5: Implement fifth generation programming language for structural modelling.

Exp 6: use of statistical methods for structural analysis and visualization.

Exp 7: To study Bayesian optimization tuning methods.

Exp 8: To study tree structured Parzen estimators.

Exp 9: To study model parameters and model hyperparameters with deep neural network.

Exp 10: To study population-based training (PBT) applied to neural network.

Exp 11: To study BOHB (Bayesian optimization and HyperBrand) algorithm.

Exp 12: To study the probability distribution using Python.

Exp 13: Sampling distribution of Arithmetic Mean.

Exp 14: To study the sampling distribution of the proportion.

Exp 15: To study sampling distribution using central limit theorem.

Exp 16: Python programs of basic inputs and out puts

Exp 17: Python programs of all data types

Exp 18: Python programs for all operators

Assessment

Practical Assessment (Marks distribution):50				
Components	Attendance	Table Viva	Record Book	Total Marks
Internal Marks	10	05	05	20
External Assessment: Semester End Practical Examination				30
Total Marks				50

- **Record book -**In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practical's in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge.

- **Attendance–**In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars).The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

- **Internal Practical Exam**: In ongoing academic semester the Internal Practical Exam are conducted to check their practical skills and techniques usually in laboratory. They will be better placed to perform well in a practical exam if they can report their methodology and observations accurately.

ANIMAL TISSUE LAB

University- MGM University, AURANGABAD **Faculty**- Science (Biotechnology)

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code-BBL-366 **Course Title**-Animal tissue lab

Credits- 0+2(2practical) **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 2hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 3/ Semester VI

Total Hours:

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective:

- To compare the four principal types of animal tissue and identify tissue types in an organ specimen.
- To understand the biology and cells of blood.
- To explore the evolution of mammalian red blood cells
- To perform a simulation of blood typing.

Learning Outcomes:

After the course, the student will be able to understand the topic in detail and develop confidence.

COURSE CONTENTS

PRACTICALS

1. Preparation of media
2. Isolation of cells from Chick embryo
3. Establishment and maintenance of primary cell cultures
4. Subculture of monolayer cells
5. Subculture of suspension cells

6. Determination of viable cells by trypan blue test

7.Establishing primary cell culture of chicken embryo fibroblasts.

8.Animal tissue culture – maintenance of established cell lines

9.Animal tissue culture – virus cultivation

10.Measurement of cell size.

11.Microphotography

Spotters:

1. Trypsinization
2. Monolayer
3. Transgenic Mice
4. Lipofection
5. Microinjection
6. Cell lines
7. Marker genes
8. Bioreactor
9. HAT

REFERENCE BOOKS

1. Strategies in Transgenic Animal Sciences - By Glemn M.M. and James M. Robl ASM 2. Press 2000.

2.Animal Cells as Bioreactors - By Terence Gartoright, Cambridge Univ Press

3. Principles and Practice of Animal Tissue Culture - By Sudha Gangal (Universities Press)

Practical Assessment for 50 marks

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	5	5	10	20
External Assessment: Semester End Practical				30
Total Marks				50

- **Record book** -In ongoing academic semester the role of Record Book is to develop their writing skills & they have the data of practicals in it.

- **Table Viva**- Table Viva is important to build student confidence. How much students are clearer about their practical Knowledge

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below.

Sr. No	Percentage of attendance	Marks
1.	70	7
2.	80	8
3.	90	9
4.	100	10

OPEN ELECTIVE COURSE

University- MGM University, AURANGABAD **Faculty**- Science (Engineering and Technology)

Institute- Institute of Biosciences and Technology **Degree**- B.Tech. Biotechnology

Course Code- BBL- 367 **Course Title**- Open Elective Course

Credits- 0+1 (1Practical) **Level of Study:UG**

Mode of delivery planned learning activities and teaching method: Lecture 3hrs / weekly

Recommended Year /Semester: B.Tech. Biotechnology, Year 3/ Semester VI

Total Hours:

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form.

Objective: Students will have interdisciplinary approach to learn a subject. The students have more scope to enhance their skills and more scope of taking up case studies, projects and assignments, vocational training including entrepreneurship.

Learning Outcomes: It will lead to have job opportunities to the students

COURSE CONTENTS

Practical- Online Session (open elective courses of their own choice)

Assessment of OEC (1 Credit: 50Marks)

Internal Evaluation

Internal Assessment	10Marks
Weekly Report Submission	10Marks

- Student should register and submit joining certificate/ registered authentic document to OEC coordinator.
- Students should submit weekly report on the basis of course.
- OEC coordinator will conduct their continuous assessment for all activities during semester.

External Evaluation

Certificate Submission	30Marks

Note: If the student unable to submit the OEC Certificate, for them there will be conduction of department (internal) examination, on the basis of open elective course syllabus submitted / selected by students.

University: MGM University, Aurangabad **Faculty:** Science (Engineering and Technology)

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biomedical Engineering

Course Code- BBL-368 **Course Title: Mini project**

Credits- 0+1 (1 Practical) **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 3 hrs/weekly

Recommended Year /Semester: B. Tech- Biomedical Engineering, Year 3/ Semester VI

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: Students will get familiar to the topic in detail. They will have hands on different instruments. They will develop technical handling skills.

Learning outcomes: Students will gain knowledge about need of research in particular field and the idea development of how the lacuna can be erased that can be of social benefit.

COURSE CONTENTS

Practical

1. Synopsis
2. Project work
3. Thesis Writing
4. Presentation

Project Assessment (50 Marks)

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
5	5	5	5	20
External Assessment				30
Total Marks				50

Ideas of project:

Defining projects ideas is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management.

Literature survey:

A literature review establishes familiarity with and understanding of current research in a particular field before carrying out a new investigation. Conducting a literature review should enable you to find out what research has already been done and identify what is unknown within your topic.

- **Attendance:**

In ongoing semester attendance are important for students. They are expected to do their project in the semester that is timetabled. The criteria of attendance are given below.

Sr.No.	Percentage of attendance	Marks
1.	70	2
2.	80	3
3.	90	4
4.	100	5

Project External Assessment (Marks distribution):30

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	05	05	05	10	05	30
Total marks						50

SEMINAR

University: MGM University, Aurangabad **Faculty:** Science(Engineering and Technology)

Institute: Institute of Biosciences and Technology. **Degree:** B. Tech- Biotechnology

Course Code- BBL-369 **Course Title:** Seminar (Research Paper Based)

Credits- 0+1 (1 Practical) **Level of Study:** UG

Mode of delivery planned learning activities and teaching method: Lecture 1 hrs/weekly

Recommended Year /Semester: B. Tech- Biotechnology, Year 3/ Semester VI

Prerequisites for registration: Registration of a student in various courses in consultation with the respective course teacher and Adviser and acceptance by the Principal. The approved courses must be mentioned in the roster form

Objective: To encourage students to explore the connection between university study and life enrichment, lifelong learning, and civic responsibility. To promote respect for diversity issues and concepts.

Learning Outcomes: Improve your presentation and communication skills.

Get feedback on an early version of your latest work.

Engage in high-level debates and refine your ideas

Hear about the latest research

COURSE CONTENTS

THEORY

1. Seminar on topic of interest from course
2. Seminar document Presentation
3. Presentation

SEMINAR ASSESMENT (Marks distribution): 50

Seminar Topic	Understanding of Subject	Presentation	Attendance	Total Marks
05	05	05	05	20
External Assessment:				30
Total Marks				50

- **Attendance –** In ongoing semester attendance are important for students. They are expected to attend all sessions in the semester that are timetabled (practical, lectures, seminars). The criteria of attendance are given below. (Equal weightage of percentage to marks is given)

Sr. No	Percentage of attendance	Marks
13.	70	2
14.	80	3
15.	90	4
16.	100	5