

MGM UNIVERSITY, AURANGABAD
INSTITUTE OF BIOSCIENCES AND TECHNOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Sciences

Post Graduate (PG) programme

M.Sc. MICROBIOLOGY/ VIROLOGY - CURRICULUM

w. e. f. Academic Year 2021-22

M.Sc. Microbiology/ Virology 1styr I Sem

SEMESTER-I

CURRICULUM

Semester I

Course code*	Course Title	Type	Teaching Scheme			Evaluation Scheme						Minimum Passing						Credit
						Internal			External			Total	Internal			External		
			(Mandatory)	L	T	P	CA	MSE	TW	ESE	PR		CA	MSE	TW	ESE	PR	
MMI-111	Microbiology and Immunotechnologies	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-112	Advanced Microbiology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-113	Molecular Cell Biology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-114	Biochemistry	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MVL-115	Micro Lab (Practical)	Pracitcal			4			40		60	100	-	-	16		24	40	2
MVL-116	Biotechniques Lab (Practical)	Pracitcal			2			20		30	50	-	-	8		12	20	1
MVL-117	Mini Project	Pracitcal			4			40		60	100	-	-	16		24	40	2
MVL-118	Seminar	Pracitcal			1			20		30	50	-	-	8		12	20	1
MVL-119	Open Elective Course	Pracitcal			1			20		30	50	-	-	8		12	20	1
	Total		16		12	80	80	140	240	210	750	0	0	56	96	84	300	23

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, MSE- Mid Semester Examination, ESE- End Semester Examination, PR-Practical, TW-Term Work

MICROBIOLOGY AND IMMUNOTECHNOLOGIES

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI-111

Course Unit Title: Microbiology &
Immuno technology

Credits allocated: 4+0 (4 Theory+ 0 Practical)

Level of Study: PG

Mode of delivery, planned learning activities and teaching method: Lecture 4 hrs weekly

Recommended Year/Semester: M.Sc. Microbiology / Virology, Year 1/ I Semester

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

Candidate should pass in Under Graduate Life Sciences.

Course Outcome:

During the course, the student should achieve knowledge about microorganisms and their metabolism and physiology, and get training in problem-solving, critical and ethical analysis of scientific work in the field. On completion of the course, the student should be able to:

1. account for morphology, metabolism, physiology and evolution of microorganisms; explain some vital processes at the molecular level and relate this to adaptation processes of microorganisms
2. account for different methods of cultivation of microorganisms and how these can be used in industrial context
3. explain co-operation between microorganisms via different signalling processes, how these function on the molecular level and control complex processes such as differentiation and biofilm formation
4. work with microorganisms at the laboratory and characterise both physiological and molecular properties
5. analyse microbiological research data, draw conclusions from them and design testing hypotheses from the analysed data
6. analyse critically and ethically scientific work within the field

Detailed Syllabus

Theory

Unit 1 Introduction

The structure and function of cells, Molecular mechanisms behind cell function, Microbial diversity and evolution, microbial genetic exchange, molecular phylogeny, Groups of bacteria, Archaea and unicellular eukaryotes.

Unit 2 Metabolism, physiology and Earth's Microbiomes

Metabolism and physiology: Aerobic and anaerobic energy production, uptake and secretion mechanisms. Cell growth, cell culture and cultivation methods. Co-operation between organisms: signalling, attack and defence; biofilm, differentiation. Virulence factors, secondary metabolism, production of antibiotics and resistance.

Earth's Microbiomes- general introduction to the diverse roles of microorganisms in natural and artificial environments. Energetics, and growth; evolution and gene flow; population and community dynamics; water and soil microbiology; biogeochemical cycling; and microorganisms in bio-deterioration and bioremediation.

Unit 3 Methods in immunology

Serology- Introduction and classification of antigens and antibody reactions – Agglutination and precipitation reactions. Strength of antigen and antibody binding- Affinity & Avidity. Monoclonal antibodies and their applications. Immunofluorescence RIA, ELISA, Flowcytometry, Microscopy.

Unit 4 Genomics and Evolution of Infectious Disease

Genomics and Evolution of Infectious Disease--introduction to the forces driving infectious disease evolution, relevant to public health. Mechanisms of genome variation in bacteria and viruses, population genetics, outbreak detection and tracking, strategies to impede the evolution of drug resistance, emergence of new disease, microbiomes and metagenomics.

Unit 5 Cellular and Molecular Immunology

Cells of the Immune System, Lymphocyte Homing, Antibodies and Antigens, Antigen Receptors and the Generation of Diversity, B Lymphocyte Development and Activation, Antibody Dependent Protection , T Lymphocyte Development, Signal Transduction in Lymphocytes I , Cell Mediated Immunity, Signal Transduction in Lymphocytes II , Dendritic Cells, Frontiers: Costimulation , Memory and Death, Immunology of TB, Immune Mediated Injury, Asthma and Allergy, Frontiers: DC and Innate Immunity, Multiple Sclerosis, Frontiers: Autoimmune TCRs, Leukemias and Lymphomas, CD1 and Lipid Antigens , Transplantation Immunology, Immunology of HIV/AIDS, Frontiers: Genetic Instability and Cancer , Regulatory T Cells , Bone

Marrow Transplant, Tumor Immunology, Regulating Humoral Autoimmunity , Inflammatory Bowel Disease , Immunodeficiency Disorders , RA and Lupus, Genetic Susceptibility to Disease

Suggested Reading/ Reference Books/ Text Books

1. Microbiology by Prescott.
2. Immunology by Kuby.

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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

ADVANCED MICROBIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/ Virology

Course Unit Code: MMI-112

Course Unit Title: Advanced Microbiology

Credits allocated: 4+0 (4 Theory+ 0 Practical)

Level of Study: PG

Mode of delivery, planned learning activities and teaching method: Lecture 4 hrs weekly

Recommended Year /Semester:M.Sc.Microbiology / Virology, Year 1/ I Semester

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. Candidate should pass in post Graduate life Sciences.

Objective and outcome missing

Detailed Syllabus

Theory

Unit I Environmental DNA

An Emerging Tool for Understanding Aquatic Biodiversity using eDNA to Conduct Fisheries Surveys, using eDNA for Early Detection of Invasive Species, Future eDNA Surveys Expanded to Other Species

Unit II Pangenome

an introduction on pan-omics focused to Crick's Central Dogma, the use of bioinformatics approaches applied to pan-genomics and their challenges, with a list of software that may be useful in this context, describes the pan-genomics analyses of *Corynebacterium diphtheriae* and *Corynebacterium ulcerans*, the causative agents of diphtheria and diphtheria-like diseases.

Unit III Functional Metagenomics

Metagenomic Cosmid Libraries Suitable for Functional Screening in Proteobacteria, Expression Platforms for Functional Metagenomics: Emerging Technology Options Beyond Escherichia coli, Challenges and Opportunities in Discovery of Secondary Metabolites Using a Functional Metagenomic Approach

Unit IV metabolomics

Important applications of metabolomics in medicine, Evolution that becomes revolution: metabolomics as the generator of hypotheses

Unit V Microbiome to CRISPR

The brain–gut connection and microbiota: the gut’s revenge, Three different enterotypes
New concepts in microbiology Bacteria: many friends, few enemies, Bacteria: highly organised unicellular microorganism, The RNA revolution, from CRISPR Defence system to the CRISPR/cas9 method for modifying genomes, antibiotic resistance

References

1. Pan-genomics Applications, Challenges, and Future Prospects DebmalyaBarh.
2. Functional Metagenomics Tools and Applications Trevor C. Charles, Mark R. Liles.
3. Metabolomics and Microbiomics. Personalized Medicine from the Fetus to the Adult Vassilios Fanos.
4. The New Microbiology From Microbiomes to CRISPR Pascale Cossart.

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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MOLECULAR CELL BIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/ Virology

Course Unit Code: MMI-113

Course Unit Title: Molecular Cell Biology

Credits allocated: 4+0 (4 Theory+ 0 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology, 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

Candidate should pass in Under Graduate Life Sciences.

Learning Outcomes: 1. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles 2. ... Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.

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

Detailed Syllabus

Theory

Unit I

The Mendelian View of the World: Mendel's Discoveries, Chromosomal Theory of Heredity, the origin of genetic variability through mutation, early speculation about what genes are & how they act, preliminary attempts to find a gene-protein relationship.

Nucleic Acids Convey Genetic Information: Avery's Bombshell: DNA, The Duplex Helix, The Genetic Information Within DNA is Conveyed by the Sequence of its Four Nucleotide Building Blocks, The Central Dogma, Establishing the direction of protein synthesis, the era of genomics.

Importance of Weak Chemical Interaction: Characteristic of chemical bonds, the concepts of free energy, weak bonds in biological systems.

Importance of High Energy Bonds: Molecules that donate energy are thermodynamically unstable, Enzymes lower activation energies on biochemical reaction, free energy in biomolecules, High energy Bonds in biosynthetic reactions, activation of precursors in group transfer reactions.

Weak & Strong Bonds Determine Macromolecular structure: Higher- order structures are determined by intra and intermolecular interactions, specific confirmation of a protein results from its pattern of Hydrogen Bonds, most proteins are Modular, containing two or three Domains, Weak Bonds Correctly position proteins along DNA & RNA Molecules, Allostery: Regulation of a proteins function by changing its shape.

Structure of DNA & RNA: DNA Structure, DNA Topology, RNA Structure.

Chromosome, Chromatin, & Nucleosome: Chromosome Sequence and Diversity, Chromosome Duplication & Segregation, the Nucleosome, Higher -Order Chromatin Structure, Regulation of chromatin Structure.

UNIT II

Replication of DNA: Chemistry of DNA Synthesis, Mechanism of DNA Polymerase, Replication Fork, Specialization of DNA Polymerase, DNA Synthesis at the Replication Fork, Initiation of DNA Replication, Binding & Unwinding: origin selection & activation by the initiation protein, Finishing Replication.

The Mutability & Repair of DNA: Replication errors & their repair, DNA Domain, Repair of DNA Damage.

Homologous Recombination at the Molecular Level: Models for Homologous Recombination, Homologous Recombination Protein Machines, Homologous Recombination in Eukaryotes, Mating-Type Switching, Genetic Consequences of the mechanism of homologous recombination.

Site-Specific Recombination & Transposition of DNA: Conservative Site-Specific Recombination, Biological Roles of Site-Specific Recombination, Transposition, Examples of Transposable Elements & their Regulation, V(D)J Recombination.

UNIT III:

Mechanism of Transcription: RNA Polymerases & the Transcription Cycle, Transcription cycle in Bacteria, Transcription in Eukaryotes.

RNA Splicing: The Chemistry of RNA Splicing, Spliceosome Machinery, Splicing Pathway, Alternative Splicing Exon Shuffling, RNA Editing, mRNA Transport.

Translation: Messenger RNA, Transfer RNA, Attachment of Amino Acids to tRNA, The Ribosome, Initiation of Translation, Translation Elongation, Termination of Translation, Translation, Different Regulation of mRNA & Protein Stability.

The Genetic Code: the code is degenerate, three rules govern the genetic code, suppressor mutation or a different gene, the codes are nearly universal.

UNIT IV:

Gene Regulation in Prokaryotes: Principles of Transcriptional Regulation, Regulation of Transcription Initiation: Examples from Bacteria, Example of Gene Regulation at Steps after Transcription Initiation, The Case Phage Lambda: Layer of Regulation.

Gene Regulation in Eukaryotes: Conserved Mechanisms of Transcriptional Regulation from Yeast to Mammals, Recruitment of Protein Complexes to Genes by Eukaryotic Activators, Signal Integration & Combinatorial Control, Transcriptional Repressors Signal Transduction & the Control of Transcriptional Regulators, Gene “SILENCING” by Modification of Histones & DNA, Eukaryotic Gene Regulation at steps after transcription initiation, RNAs in Gene Regulation.

Gene Regulation during Development: Three strategies by which cells are instructed to express specific sets of genes during development, Example of the three strategies for establishing differential gene expression, the molecular biology of *Drosophila* Embryogenesis.

Comparative Genomic & the Evolution of Animal Diversity: Most animals have essentially the same genes, three ways gene expression is changed during evolution, Experimental manipulations that alter animal morphology, morphological changes in crustaceans & insects, genome evolution & human origins.

UNIT V:

Techniques of Molecular Biology: Introduction, Nucleic Acids, Proteins.

Model Organisms: Bacteriophage, Bacteria, Baker's Yeast-*Saccharomyces cerevisiae*, Nematode Worm-*Caenorhabditis elegans*, The Fruit Fly-*Drosophila melanogaster*, The House Mouse-*Mus musculus*.

Stem Cells and Tissue Renewal: Stem Cells and Renewal in Epithelial Tissues, Fibroblasts and Their Transformations: the Connective-Tissue Cell Family, Genesis and Regeneration of Skeletal

l Muscle, Blood Vessels, Lymphatics , and Endothelial Cells, A Hierarchical Stem-Cell System: Blood CellFormation, Regenerati on and Repair, Cell Reprogramming and Pluripotent Stem Cells.

Pathogens and Infection: introduction to pathogens and the humanmicrobiota, cell biology of infection.

Textbook

1. Molecular Biology of the Gene by Watson
2. Cooper-Hausman, The Cell A Molecular Approach-
3. Lodish, et al. Molecular Cell Biology. 5th ed. New York, NY: W.H. Freeman and Company, 2003. ISBN: 9780716743668.
4. Hardin, J, and Bertoni, G.P. 2015. Becker’s World of the Cell, 9th edition, Pearson
5. Bruce Alberts, et al. Molecular biology of the cell. Garland Science, 2015. 6th edition.
6. Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts, and Walter. 2014. Essential Cell Biology 4th ed. Garland Science. ISBN: 978-0-8153-4454-4.

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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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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

BIOCHEMISTRY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc.Microbiology/Virology

Course Unit Code: MMI-114

Course Unit Title: Biochemistry

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

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

Recommended Year /Semester: M.Sc.Microbiology / Virology, 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.

Candidate should pass in under graduate life science.

Learning Outcomes: Students will be able to understand microbial Biochemistry-Carbohydrate, Cell membrane and transport, Energy production in bacteria, Enzyme-Classification and nomenclature and Photosynthetic bacteria and cyanobacteria interpret and apply nutrition concepts to evaluate and improve the nutritional health of communities.

Objective: Microbial Physiology is the study of structure, function, energy metabolism, growth and regulatory mechanisms of microorganisms. In this course, the students will learn about the metabolic diversity exhibited by microorganisms, their thermodynamics and regulatory networks that support their survival and growth

Detailed Syllabus

Theory

Unit 1: Structures & Functions of Proteins & Enzymes

Amino acids & Peptides, Proteins: Determination of Primary Structure, Proteins: Higher orders of structure, Proteins: Myoglobin & Hemoglobin, Enzymes: Mechanism of Action, Enzymes: Kinetics, Enzymes: Regulation of Activities, Bioinformatics & Computational biology

Bioenergetics & The Metabolism of Carbohydrates & Lipids

Bioenergetics: The role of ATP, Biologic Oxidation, The Respiratory Chain & Oxidative Phosphorylation, Carbohydrates of Physiologic Significance, Lipids of Physiologic Significance, Overview of Metabolism & the provision of metabolic Fuels, The Citric acid cycle: The catabolism of Acetyl- Co A, Glycolysis & the Oxidation of Pyruvate, Metabolism of Glycogen, Gluconeogenesis & the Control of blood glucose, The pentose phosphate pathway & other pathways of hexose metabolism

Unit 2: Metabolism of Proteins & Amino Acids

Biosynthesis of the nutritionally Nonessential amino acids, Catabolism of Proteins & of amino acid nitrogen, Catabolism of the carbon skeletons of amino acids, Conversion of Amino Acids to Specialized products, Polyphyrins& Bile pigments.

Unit 3: Structure, Function & Replication of Informational Macromolecules

Nucleotides, Metabolism of Purine & Pyrimidine nucleotides, Nucleic acid, Structure & function, Nucleic acid structure & function, DNA Organization, Replication, & Repair, RNA synthesis, Processing & Modification, Protein Synthesis & genetic code, Regulation of gene expression, Molecular genetics, Recombinant DNA, & Genomic Technology

Unit 4: Biochemistry of Extracellular & Intracellular Communication

Membranes: Structure & Function, The Diversity of Endocrine system, hormone action & Signal Transduction, Nutrition, Digestion & Absorption, Micronutrients: Vitamins & Minerals, Free radicals and Antioxidant Nutrients

Unit 5 Protein Sorting

Intracellular Traffic & Sorting of Proteins, Glycoproteins, The Extracellular matrix, Muscle & The Cytoskeleton, Plasma Proteins & Immunoglobulins, Hemostasis & Thrombosis, Red & White blood cells, Metabolism of Xenobiotics, Biochemical Case histories

Suggested Readings / Reference Books/ Text Books

1. Berg, J.M., Stryer, L. (2002) *Biochemistry* W.H Freeman & Company
2. Nelson, D.L., Cox, M. (2008) *Lehninger's Principles of Biochemistry* Mac Millan
3. Voet, D and Voet, J.G (2010) *Biochemistry* 4th edition Wiley
4. Jain, J.L. (2005) *Fundamentals of Biochemistry* 6th edition S.Chand & Co
5. Deb, A.C. (2001) *Fundamentals of Biochemistry* New Central Book Agency (P) Ltd
6. Pelczar, M.J., Chan, E.C.S and Kraig (1977) *Microbiology* Mc Graw-Hill
7. Talaro, K.P., and Talaro A. (2004) *Foundations of Microbiology* 5th edition Mc Graw-Hill
8. Aneja, K.R., Jain, P. and Aneja, R. (2008) *Text book of Basic and Applied Microbiology* New Age International

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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MICRO LAB

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-115

Course Unit Title: Micro Lab.

Credits allocated: 0+2 (0 Theory+ 2 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology, 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.

Candidate should pass in under graduate life science.

List of Practicals

1. Enumeration of bacteria by plate count or serial dilution- agar plate technique
2. Isolation of bacteria from soil and air
3. Determination of total water bacterial population by plate count technique
4. Staining method: Simple and Negative staining
5. Staining method: Gram Staining
6. Maintenance of pure culture
7. Studying morphology of fungi by using microscope
8. Microscopic examination of free living protozoa of pond
9. Determination of population growth by turbidity
10. Biochemical activities of bacteria: Starch hydrolysis and Citrate utilization
11. Biochemical activities of bacteria: MR-VP and Indole
12. Biochemical activities of bacteria: Fermentation of Carbohydrates
13. To isolate rhizobium from root nodules
14. Effect of temperature on microbial growth
15. Effect of pH on microbial growth
16. Chemical agent control: Evaluation of disinfectants (Phenol coefficient)
17. Chemical agent control: Evaluation of antiseptics by filter paper discs method
18. Isolation of antibiotic resistant bacterial population by gradient plate method
19. Detection of coliform to determine water purity using membrane filter method
20. DNA isolation from bacteria
21. Polymerase chain reaction (PCR)

Reference: -

1. Dubey,R.C and Maheswari,D.K (2002)*Practical Microbiology* S.Chand Ltd
2. Cappuccino,J.G.,Sherman,S(2002) *Microbiology. A Laboratory Manual* Benjamin-Cummings Publishing Company
3. Aneja KR (2003) *Experiments In Microbiology, Plant Pathology And Biotechnology.* New Age International.

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 Bachelor's degree programmers.

Practical Assessment

Components	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	10	10	20	40
External Assessment: Semester End Practical				60
Total Marks				100

- **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	14
2.	80	16
3.	90	18
4.	100	20

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.

BIOTECHNIQUES LAB

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-116

Course Unit Title: Biotechniques Lab

Credits allocated: 0+1 (0 Theory+ 1 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology, 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.

Candidate should pass in under graduate life science.

List of Practical:

1. Double immune difussion assay
2. Blood agglutination test
3. Widal test
4. ELISA
5. Estimation of protein by lowry method
6. Estimation of protein by biuret method
7. Quantitative method of reducing suger by DNSA method
8. Qualitative analysis of carbohydrates by Molisch reagent
9. Qualitative analysis of carbohydrate by benedict's method
10. Qualitative analysis of carbohydrate by Fehling's test
11. Estimation of RNA by ornicol method
12. TLC-Separation of lipids by TLC method
13. Titration-Estimation of pKa values of amino acid by titration curves.
14. Isolation of DNA
15. Gel electrophoresis
16. SDS PAGE
17. PCR
18. Preparation of common antigen from bacteria
19. Preparation of antiserum
20. Separation of amino acids by paper chromatography
21. To study & Understand different types of Centrifuge

22. To study & understand different types of Microscope with help of different samples
23. To study & understand different types of chromatography; ion exchange, paper, 2D TLC, HPLC, Gas chromatography
24. To Understand the principle of pH meter, colorimeter, spectrophotometer, UV, IR and flurometer.
25. To study basic law of light absorption and standard curve
26. To study the basic method & calculation of cell count by neubauer chamber

Reference: -

1. Dubey,R.C and Maheswari,D.K (2002)*Practical Microbiology* S.Chand Ltd
2. Cappuccino,J.G.,Sherman,S(2002) *Microbiology. A Laboratory Manual* Benjamin Cummings Publishing Company
3. Aneja KR (2003) *Experiments In Microbiology, Plant Pathology And Biotechnology*. New Age International.

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.

MINI PROJECT

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-117

Course Unit Title: Mini Project

Credits allocated: 0+2 (0 Theory+ 2 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology, Year I/ Semester I

Course Outcomes:

1. Students will be able to practice acquired knowledge within the chosen area of technology for project development.
2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.

Ideas of project:

Defining project 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.

Performance:

Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. The criteria of it as given below.

1. Implementation:

Follows closely the design, uses appropriate techniques with skill and understanding to produce a good solution.

2. Evaluation:

Clearly relates to the problem. Shows a good understanding and appreciation of the solution. Objectives of what has been done.

3. Project Log:

- a. The individual student's effort and commitment.
- b. The quality of the work produced by the individual student.
- c. The student's integration and co-operation with the rest of the group.
- d. The completeness of the logbook & time to time signature of guide

Objective: To elaborate the procedure for Guiding Student projects

Thrust Area of Project:

- Regenerative medicine
- Stem cell engineering
- Pathogen & infection
- Development of multicellular organisms
- Energy conversion: Mitochondria & chloroplast
- Biomaterial science
- Tissue engineering
- Micro evaluation
- Microbiome
- Host-microbe interaction
- Bioelectronics
- Sustainable biotechnology
- RNA biology
- RNA vaccine

Internal Assessment

Project Assessment (100 Marks)

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
10	10	10	10	40
External Assessment				60
Total Marks				100

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.

Performance:

Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. The criteria of it as given below.

1. Implementation:

Follows closely the design, uses appropriate techniques with skill and understanding to produce a good solution.

2. Evaluation:

Clearly relates solution to the problem. Shows a good understanding and appreciation of the solution. Objectives of what has been done.

3. Project Log:

- a. The individual student's effort and commitment.
- b. The quality of the work produced by the individual student.
- c. The student's integration and co-operation with the rest of the group.
- d. The completeness of the logbook & time to time signature of guide

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

Project External Assessment (Marks distribution):60

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
		10	10	10	20	10
Total marks						100

SEMINAR

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-118

Course Unit Title: Seminar

Credits allocated: 0+1 (0 Theory+ 1 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology Year I/ Semester I

Course Outcomes:

1. The purpose of a seminar is to create an experience of working together.
2. One of the main objectives of conducting seminars is to avoid a passive experience everyone should have a way to contribute and communication and also stage daring Improves.

- 1) The allotted faculty will notify about seminar conduction to the students of respective class.
- 2) The seminar topics will be listed by the students initially based on their topic of interest.
- 3) The seminar topics will be discussed with the faculty for finalizing the topic.
- 4) The finalized seminar topics will be displayed on the notice board with Director's approval.
- 5) The students will prepare the seminar topics; PPT and word file in allotted hours.
- 6) The final seminar presentation will be done by the students according t the exam date scheduled by the University,
- 7) Evaluation of the final seminar presentation and the word file will be done by the external examiner allotted by the University.

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

OPEN ELECTIVE COURSE

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-119

Course Unit Title: Open Elective Course

Credits allocated: 0+1 (0 Theory+ 1 Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology / Virology-Master of Science, Year I/ 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.

Candidates should pass in undergraduate Life Science.

SOP for Open elective Courses (PG I, II III & IV semester)

- It is mandatory for undergraduate & post graduate students to undertake open elective courses for concern credits before the completion of the degree.
- Students have the option of choosing any open Elective courses under the category of mandatory elective courses.
- A student is not eligible for more than one open Elective course under the category of mandatory courses.
- For UG and PG programs the Open Electives are offered within the regular class hours.
- These courses generally earn concern credits consisting of 8 weeks-12 weeks during the completion of semester.
- Students can view the complete details of the courses offered Elective courses in their course layout.
- Till a student finishes OEC under the mandatory course category, he/she is eligible to apply for other open elective courses.
- Evaluation pattern is the discretion of the faculty concerned for UG & PG courses will be with only end semester examinations
- Examinations are conducted by the departments concerned and the results are indicated only in Grades in the marks card.

- Minimum pass percentage is 40% for courses under the mandatory category. Grades are awarded only if the student passes.
- These courses are conducted after or before the regular class hours and the courses offered are different in Odd and Even semesters.
- Students are advised to finalize their choice of programs in consultation with their OEC coordinator.
- Minimum prescribed attendance for these courses is 85%. **Medical and co-curricular claim will be considered only if the student put in 75% physical attendance or the classes.**
- Attendance claim shall be submitted to OEC coordinator within 07 days after availing the leave.
- Students who fail to secure the minimum pass marks or required minimum attendance or who discontinue in between the course are required to register afresh. Re-registration is permitted only in the subsequent semester which may be for the same course or any other courses from the choices available during the particular semester.
- He / She submit course syllabus weekly report on the basis of that OEC co-ordinator conduct their continuous assessment.
- A student is not eligible to graduate without completing OEC mandatory course.
- OEC offered by other departments like Performing Arts, Industrial Automation, Industry 4.0, Vastushashtra, Sketching, Hotel Management, Film Making, Python programming, Theatre and Music etc.
- Each course admits only 40 students on a first-come-first-served basis. Courses which do not get minimum required applications may not be conducted.

The Department/Centre/Office of the activity/event concerned will set the relevant parameters to measure the content of each given criterion depending on the need and application of the particular activity/event and will assess the performance of every student objectively.

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
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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.

MGM UNIVERSITY, AURANGABAD
INSTITUTE OF BIOSCIENCES AND TECHNOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Sciences

Post Graduate (PG) programme

M.Sc. MICROBIOLOGY/ VIROLOGY - CURRICULUM

w. e. f. Academic Year 2021-22

M.Sc. Microbiology/ Virology 1st yr IInd Sem

SEMESTER-II

CURRICULUM

Semester II																		
Course code*	Course Title	Type	Teaching Scheme			Evaluation Scheme						Minimum Passing						Credit
						Internal			External			Total	Internal			External		
(Mandatory)			L	T	P	CA	MSE	TW	ESE	PR	CA		MSE	TW	ESE	PR		
MMI-121	Pharmaceutical Microbiology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-122	Mycology and Parasitology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-123	Industrial Microbiology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-124	Clinical and Diagnostic Microbiology	Theory	4			20	20		60		100	-	-	-	24	-	40	3
MVL-125	Microbial Lab (Practical)	Pracitcal			6			40		60	100	-	-	16		24	40	3
MVL-126	Diagnosis Lab (Practical)	Pracitcal			2			20		30	50	-	-	8		12	20	1
MVL-127	Micro Project	Pracitcal			4			40		60	100	-	-	16		24	40	2
MVL-128	Seminar	Pracitcal			1			20		30	50	-	-	8		12	20	1
MVL-129	Open Elective Course	Pracitcal			1			20		30	50	-	-	8		12	20	1
	Total		16		14	80	80	140	240	210	750	0	0	56	96	84	300	23

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, MSE- Mid Semester Examination, ESE- End Semester Examination, PR-Practical, TW- Term Work

PHARMACEUTICAL MICROBIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI 121

Course Unit Title: Pharmaceutical
Microbiology

Credits allocated: 4+0 (4 Theory+ 0 Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology/Virology -Masters of Science, 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

Learning Outcomes: Upon successful completion, students will have the knowledge and skills to:
By the end of the course you will:

Understand the types and sources of different types of micro-organisms that are related to pharmaceutical operations

Be aware of different techniques for the sterilisation of products and the associated components/equipment

Understand what checks and tests can be performed to help manage microbiological issues

Objective: After completing this rotation, the intern will be able to: pharmaceutical microbiology is to ensure safety and efficacy of pharmaceutical products. It embraces the processes like the validation of disinfectants, evaluation of the efficacy of disinfectants in suspension, on surfaces, and through field trials.

Detailed Syllabus

Theory

UNIT I

History; contributions of Paul Ehrlich, Edward Jenner, Alexander Fleming. Bioactive molecules – extraction, purification and characterization; safety profile, toxicological evaluation of drugs, mutagenicity, carcinogenicity and teratogenicity. Drug interactions and drug metabolism.

UNIT II

Introduction of medicines in market- role of FDA clinical trials- objectives, conduct and outcome; drug delivery systems

UNIT III

Different types of antibiotics; mechanism of action of antibiotics; assay of antibiotics penicillin; vaccines – active and passive immunization; conventional bacterial and viral vaccines

UNIT IV

Pharmacognosy – brief introduction. Significance in Indian systems of medicine- Siddha, ayurveda and unani. Active principles and medicinal uses of the following- *Adathodavasica*, *Rauolfia serpentina*, *Curcuma longa*, *Ocimum sanctum*, *Coleus aromaticus* and *Phyllanthus niruri*. Antimicrobial activity testing of herbal extracts.

SUGGESTED READINGS

1. Agarwal S. S. and Paridhavi M., (2007), *Herbal Drug Technology*, Universities Press (India) Pvt. Ltd
2. Bentley's Textbook of Pharmaceutics, Editor E. A. Rawlins, 8th Ed. (2002), BAilliere Tindall, London
3. Chatwal G. P. (2003) *Biopharmaceutics and Pharmacokinetics*, Himalaya Publishing House, Mumbai.
4. Chorghade Mukund S., (2006), *Drug discovery and development Volume I: Drug discovery*, Wiley-Interscience, John Wiley and Sons Inc. USA.
5. Dewick Paul M., (2002), *Medicinal natural products: A biosynthetic approach*, 2nd Ed., John Wiley and Sons
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8. Kokate C. K., Purohit A. P., Gokhale A. B. (2000) *Pharmacology*, 4th Ed., NiraliPrakashan.
9. Lorian.V., (1986), *Antibiotics in laboratory medicine*, 2nd Ed, Williams & Wilkins Publication
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10. Micheles P. S., Y. L. Khmel'nitsley, J. S. Dordick and D. S. Clark, (1998), *Combinatorial Biocatalysis, A Natural Approach to Drug Discovery*, Trends in Biotechnol. **16**, 197.
11. National Committee for Clinical Laboratory Standards (now Clinical and Laboratory Standards Institute, CLSI). *Methods for dilution antimicrobial susceptibility testing for bacteria that grows aerobically. Approved Standards M7-A4*. Villanova, PA: NCCLS, 1997.
12. National Committee for Clinical Laboratory Standards (now Clinical and Laboratory Standards Institute, CLSI). *Performance standards for antimicrobial susceptibility testing; 12th information supplement (M100-S1)*. Villanova, PA; NCCLS: 2002

13. Satoskar R. S. & S. D. Bhandarkar (1991) *Pharmacology and Pharmacotherapeutics*, 12th Ed., Vol. 1 & 2, Popular Prakashan, Mumbai.

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15. Walsh Gary, (2003), *Biopharmaceuticals Biochemistry And Biotechnology*, 2nd Ed., John Wiley & Sons Ltd, England

16. Vyas S. P and Dixit V. R. (2002), *Pharmaceutical Biotechnology*, CBS Publishers and Distributors, New Delhi

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

III. 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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MYCOLOGY AND PARASITOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI 122

CourseUnitTitle: Mycology and Parasitology

Credits allocated: 4+0 (4 Theory+ 0 Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology and Virology Masters of Science, 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

Learning Outcomes: Upon successful completion, students will have the knowledge and skills to: General properties, clinical importance, pathogenesis and laboratory diagnosis of diseases cause, Viral haemorrhagic fevers, Classification of Mycoses in man, superficial mycoses and Life cycle and pathogenesis of important Protozoan diseases

Objective: After completing this rotation, the intern will be able to: Describe and explain importance, pathogenicity Life cycle and pathogenesis of important Protozoan diseases .

Detailed Syllabus

Theory

UNIT I

General properties, clinical importance, pathogenesis and laboratory diagnosis of diseases caused by Picorna, Orthomyxo, Paramyxo, Rhabdo, and Rubella viruses. General characters, clinical importance, pathogenesis and laboratory diagnosis of diseases caused by Aboviruses and Hepatitis viruses, SARS and HIV.

UNIT III

Viral haemorrhagic fevers, Slow virus infections, Prion diseases, Viruses and cancer, Viruses implicated in the cancers of humans, Prophylaxis of viral diseases, antiviral agents. Mechanisms of action Interferons, Emerging viral infections.

UNIT IV

Classification of Mycoses in man, superficial mycoses – surface and cutaneous mycoses, Deep mycoses – subcutaneous and systemic mycoses, pathogenesis, clinical aspects and lab diagnosis of fungal infections. Opportunistic fungal infections.

UNIT V

Life cycle and pathogenesis of important Protozoan diseases- Entamoebiasis, Malaria, Trypanosomiasis and Leishmaniasis. Clinical importance of *Giardia*, *Trichomonas*, *Toxoplasma*, *Cryptosporidium* and *Pneumocystis*.

Practical

I - Mycology

1. Culture methods for isolation and identification of fungi- KOH mount preparation, 2. Lactophenol cotton blue staining, Slide culture technique etc.
3. Gram staining and Germ tube test of *Candida albicans*

II - Virology and Parasitology

1. Cultivation of viruses in embryonated eggs different routes – harvesting
2. Examination of peripheral blood for haemoflagellates and malarial parasites

SUGGESTED READINGS

1. Molyneux, D.H., and Ashford, R.W. (1983). *The biology of Trypanosoma and Leishmania, parasites of man and domestic animals* (New York, International Publications Service)
2. Garraway, M.O., and Evans, R.C. (1991). *Fungal nutrition and physiology* (Malabar, FL, Krieger Pub. Co.).
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4. Fraenkel-Conrat, H., and Wagner, R.R. (1974). *Comprehensive virology* (New York, Plenum Press).
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8. Rippon, J.W. (1988). *Medical mycology : the pathogenic fungi and the pathogenic actinomycetes* (Saunders ,Philadelphia)
9. Chatterjee, K.D. (2009). *Parasitology* CBS Publishers & Distributors
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11. Beaver, P.C., Jung, R.C., Cupp, E.W., and Craig, C.F. (1984). *Clinical parasitology* Lea &Febiger, Philadelphia
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13. Ananthanarayan, R., and Paniker, C.K.J. (2006). *Textbook of microbiology* Orient Blackswan.

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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

INDUSTRIAL MICROBIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI 123

CourseUnitTitle: Industrial Microbiology

Credits allocated: 4+0 (4 Theory+ 0 Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology and Virology -Masters of Science, 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

Learning Outcomes: Upon successful completion, students will have the knowledge and skills to: Historical account of microbes in industrial microbiology, Microbial growth kinetics, Industrial fermentations and Microbiology and production of ethanol and alcoholic beverages

Objective: Students will learn the basics of microbes, microbial growth, their industrial application in day to day life and beneficial versus harmful micro-organism

Detailed Syllabus

Theory

UNIT I

Historical account of microbes in industrial microbiology, Sources and characters of industrially potent microbes. Isolation, purification and preservation of industrially useful microbes, Screening methods and methods for strain improvement.

UNIT II

Microbial growth kinetics, Batch, continuous and fedbatch culture, Monod's model and deviations from Monod's model. Batch culture - specific growth rate, substrate saturation constant, yield coefficient, substrate affinity. Continuous culture- Dilution rate and Washing out. Applications and examples of fedbatch and continuous system, comparison between various cultivation systems

UNIT III

Industrial fermentations. Types of fermentations. Components of fermentation process, Media for industrial fermentation, sterilization, inoculum preparation, raw materials used in industrial fermentation media, antifoam agents, Solid substrate fermentation (SSF) - Principles and

application, Submerged Fermentation. Aerobic and anaerobic fermentation, Problems in fermentation process and handling.

UNIT IV

Fermentor – parts, design, construction and types, Pneumatically driven, hydrolytically driven, mechanically driven, CSTR, Airlift, Packed Bed, Fluidized Bed, cyclone, cylindro conical fermentors, Monitoring and control of fermentors, Control of physical and chemical conditions, online and off line instrumentation, pH, temperature, DO probes. Methods used for down-stream processing and product recovery- filtration, centrifugation, celldisruption, extraction, dialysis, Purification, Drying, Packing and labelling. Good Manufacturing Practices, Fermentation economics.

UNIT V

Microbiology and production of ethanol and alcoholic beverages, Beer manufacturing and production of distilled beverages. Microbial polyesters, biosurfactants, and recombinant products. Microbial process for the production of antibiotics (penicillin and streptomycin), vitamins (Vit. C, Vit. B12), organic acids (citric acid, lactic acid) amino acids, alkaloids, nucleotides and microbial transformation of steroids, Baker's yeast production, Bread manufacturing. Production of microbial enzymes - amylases and proteases and their applications. Immobilization of microbial cells and enzymes – methods and applications.

Suggested Readings

References

1. Aneja K.R., Jain, P and Aneja. (2008) *A text Book of Basic and Applied Microbiology* New Age International
2. Stanbury, P.F., Whitekar A and Hall. (2000) *Principles of Fermentation technology* Butterworth-Heinemann
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6. Patel,A.H(2000) *Industrial Microbiology* MacMillan
7. Bhosh,T.K., Fiechter,A and Blakebrough,N. *Advances in Biochemical Engineering* Springer

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 4) out of 5 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

III. 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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

CLINICAL AND DIAGNOSTIC MICROBIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI 124

Course Unit Title: Clinical and Diagnostic Microbiology

Credits allocated: 3+0 (3 Theory+0 Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology and Virology -Masters of Science, 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

Learning Outcomes: Upon successful completion, students will have the knowledge and skills to: Microbiology Laboratory Safety, Diagnostic cycle, Diagnosis of microbial diseases, Gastrointestinal Tract infections

Objective: The students will understand about the disease causing microbes, various cellular processes during disease development and the relevance of microbes in vaccine development

Detailed Syllabus

Theory

UNIT I

Microbiology Laboratory Safety -General Safety Principles, Handling of Biologic Hazards, Disposal of Infectious waste, Biomedical waste management, infection control practice, emerging and reemerging infections.

UNIT II

Diagnostic cycle, General concept of specimen collection, transport, processing and rejection of clinical specimens. Mailing of biohazardous materials.

UNIT III

Diagnosis of microbial diseases - Clinical, microbiological, immunological and molecular diagnosis of microbial diseases. Modern methods of microbial diagnosis. Automation in Microbiology; Laboratory control of antimicrobial therapy; Immunoprophylaxis

UNIT IV

Normal microbial flora of the human body. Etiological agents and approach to diagnosis of Blood stream infections, Respiratory tract infections, Meningitis, Urinary tract infections, Genital Tract infections, Sexually transmitted diseases, Skin and Soft tissue infections, Nosocomial infections – common types, Sources, reservoir and mode of transmission, and Measures to control

UNIT V

Gastrointestinal Tract infections, Infections of sinuses, eye and ear. bone infections, Pyrexia of unknown origin and Zoonoses. Pyogenic infections. Infections in immunocompromised and immunodeficient patients. Infections in foetus and neonates

Suggested Readings

1. Blair, J.E.e., Lennette, E.H.e., and Truant, J.P.e. (1970). Manual of clinical microbiology.
2. American Society for Microbiology, Bethesda, Md.
3. Gradwohl, R.B.H., Sonnenwirth, A.C., and Jarett, L. (1980). Gradwohl's clinical laboratory methods and diagnosis. Mosby, London.8th ed 53
4. Lennette, E.H., Balows, A., Hausler, W.J., and Shadomy, H.J. (1985). Manual of clinical microbiology. American Society for Microbiology, Washington, D.C. 4th ed.
5. Topley, W.W.C., Wilson, G.S.S., Parker, T., and Collier, L.H. (1990b). Topley and
6. Wilson's principles of bacteriology, virology and immunology. Edward Arnold,8th ed
7. Mukherjee, K.L. (2010) Medical Laboratory Technology .Tata McGraw-Hill Education.2nd ed.
8. Sood, R. 1999. Medical Laboratory Technology - Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Ltd. New Delhi. 5th ed.
9. Cheesbrough, M. (2006). District Laboratory Practice in Tropical Countries. Cambridge University Press.2nd ed.
10. Mackie, T.J., McCartney, J.E., and Collee, J.G. (1989). Mackie & McCartney practical medical microbiology. Churchill Livingstone, 13th ed
11. Black, J.G. (1999). Microbiology : principles and explorations. Prentice Hall International, London. 4th ed.
12. Kindt, T.J., Goldsby, R.A., Osborne, B.A., and Kuby, J. (2006). Kubyimmunology.W.H. Freeman, New York. 6th ed.
13. Forbes, B.A., Sahm, D.F., Weissfeld, A.S., and Bailey, W.R.D. m. (2007). Bailey & Scott's diagnostic microbiology. Elsevier, Mosby, London. 12th ed.

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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

MICROBIAL LAB

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL 125

Course Unit Title: Microbial Lab.

Credits allocated: 0+3(0 Theory+3 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology, 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.

Candidate should pass in under graduate life science

Practical

Industrial microbiology

1. Screening of industrially important microorganisms from soils, food processing waste and animal droppings.
2. To evaluate the production of alcohol from molasses, & Ligno-cellulosics.
3. Microbial biomass production (fungi/bacteria/yeast) by batch culture.
4. Microbial biomass production (fungi/bacteria/yeast) by continuous culture.
5. To compare production of citric acid using sucrose and molasses as carbon source.
6. Production of lactic acid using cheese whey as substrate.
7. Production of extra cellular enzymes (amylases, proteases, xylanases) by thermophilic and mesophilic fungal culture.
8. To isolate microorganisms for novel antibiotic production .
9. To isolate spontaneous mutants from various cultures after repeated sub culturing.
10. To induce the mutagenesis by different mutagenic agents such as NTG/UV for strain improvement.
11. To characterize the auxotrophic mutants by replica plating method
12. To study the effect of different sugar and NaCl concentration on yeast growth.
13. Effect of different temperatures on yeast growth.
14. Isolation of N fixing bacteria. Nitrifying and denitrifying bacteria.
15. Isolation of cellulase producing fungi.
16. Beer or Wine Production and Quality Assessment .

17. Production of compressed bakers' yeast
18. Screening of antibiotic producers – Crowded plate technique / organic acid producers and amine producers/ amylase producers / protease producers / vitamin producers
19. Production of Bio fertilizers using nitrogen fixing and phosphate solubilising isolates and packaging
20. Microbial production of antibiotics (penicillin)
21. Microbial production of biosurfactant

Mycology & Parasitology

1. Culture methods for isolation and identification of fungi- KOH mount preparation,
2. Lactophenol cotton blue staining, Slide culture technique etc.
3. Gram staining and Germ tube test of Candida albicans
4. Cultivation of viruses in embryonated eggs different routes – harvesting
5. Examination of peripheral blood for haemoflagellates and malarial parasites
6. Differential counting of living and dead yeast cells by direct microscopic examination
7. Study undisturbed morphological details of fungi by slide culture technique
8. Detection and Recovery of Fungi from Clinical Specimens

References :

1. Medical laboratory Manual II edition Mohamaed A Dew
2. practical microbiology Maheshwari and Dubey
3. Microbiology A Laboratory Manual By James Cappuccino, Chad Welsh

Assessment Method:

Practical Assessment for 100 marks

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	10	10	20	40
External Assessment: Semester End Practical				60
Total Marks				100

- **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	14
2.	80	16
3.	90	18
4.	100	20

- **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.

DIAGNOSIS LAB

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL 126

Course Unit Title: Diagnosis Lab.

Credits allocated: 0+1(0 Theory+1 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology, 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.

Candidate should pass in under graduate life science.

List of Practical:

Pharmaceutical microbiology

1. Spectrophotometric methods for the determination of Griesofulvin.
2. Bioassay of chloremphenicol by plate assay method or turbidimetric Assay method.
3. To determine MIC, LD 50 of Beta-lactum/aminoglycoside/ tetracycline/ansamycins.
4. Sterility testing by Bacillus stearothermophilus
5. Sampling of pharmaceuticals for microbial contamination and load (syrups, suspensions, creams and ointments, ophthalmic preparations).
6. Determination of antimicrobial activity of a chemical compound (Phenol, resorcinol, thymol, formaldehyde) to that of phenol under Standardized experimental conditions.
7. testing for antibiotic resistance /sensitivity
8. Endotoxin test
9. Microbial limit test

Clinical and diagnostic Microbiology

1. Care and maintenance of common laboratory instruments.
2. Collection and transportation of specimens for Microbiological investigations such as Blood, Urine.
3. Collection and transportation of specimens for Microbiological investigations such as Throat swab, Rectal swab, Stool, Pus, OT specimens.
4. Collection and transportation of specimens for Microbiological investigations such as, Stool, Pus, OT specimens.

5. Processing of samples, inoculation and interpretation.
6. Preservation of bacteria.
7. Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Kligler iron agar, Robertson’s cooked meat.
8. Study of normal microbial flora of human beings
9. Culture methods identification and antibiotic sensitivity test of isolates
10. Study of coagulase test .
11. Study of *S.aureus* , *S.typhi*

References :

1. Medical laboratory Manual II edition Mohamaed A Dew
2. practical microbiology Maheshwari and Dubey
3. Microbiology A Laboratory Manual By James Cappuccino, Chad Welsh
4. Pharmaceutical Microbiology A Laboratory Manual By G Shyam Prasad, Srisailam K
5. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology By K. R. Aneja
6. Lab manual basic biotechnology Verma and Das

Assessment Method:

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.

MICRO PROJECT

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL 127

Course Unit Title: Micro Project

Credits allocated: 0+2(0 Theory+2 Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology/Virology, 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.

Course Outcomes:

1. Students will be able to practice acquired knowledge within the chosen area of technology for project development.
2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.

Thrust Area of Project:

- Regenerative medicine
- Stem cell engineering
- Pathogen & infection
- Development of multicellular organisms
- Energy conversion: Mitochondria & chloroplast
- Biomaterial science
- Tissue engineering
- Micro evaluation
- Microbiome
- Host-microbe interaction
- Bioelectronics
- Sustainable biotechnology
- RNA biology
- RNA vaccine
- Climate change as biotechnology

Project Assessment (100 Marks)

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
10	10	10	10	40
External Assessment				60
Total Marks				100

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.

Performance:

Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. The criteria of it as given below.

1. Implementation:

Follows closely the design, uses appropriate techniques with skill and understanding to produce a good solution.

2. Evaluation:

Clearly relates solution to the problem. Shows a good understanding and appreciation of the solution. Objectives of what has been done.

3. Project Log:

- a. The individual student's effort and commitment.
- b. The quality of the work produced by the individual student.
- c. The student's integration and co-operation with the rest of the group.
- d. The completeness of the logbook & time to time signature of guide

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

Project External Assessment (Marks distribution):60

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	10	10	10	20	10	60
Total marks						100

SEMINAR

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL 128

Course Unit Title: Seminar

Credits allocated: 0+1(0 Theory+1Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology / Virology Year I/ Semester II

Course Outcomes:

- 1.The purpose of a seminar is to create an experience of working together.
- 2.One of the main objectives of conducting seminars is to avoid a passive experience everyone should have a way to contribute and communication and also stage daring Improves.

- 1) The allotted faculty will notify about seminar conduction to the students of respective class.
- 2) The seminar topics will be listed by the students initially based on their topic of interest.
- 3) The seminar topics will be discussed with the faculty for finalizing the topic.
- 4) The finalized seminar topics will be displayed on the notice board with Director's approval.
- 5) The students will prepare the seminar topics; PPT and word file in allotted hours.
- 6) The final seminar presentation will be done by the students according t the exam date scheduled by the University,
- 7) Evaluation of the final seminar presentation and the word file will be done by the external examiner allotted by the University.

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
5.	70	2
6.	80	3
7.	90	4
8.	100	5

OPEN ELECTIVE COURSE

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL 129

Course Unit Title: Open Elective Course

Credits allocated: 0+1(0 Theory+1Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology / Virology-Master of Science, Year I/ 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.

Candidates should pass in undergraduate Life Science.

SOP for Open elective Courses (PG I, II III & IV semester)

- It is mandatory for undergraduate & post graduate students to undertake open elective courses for concern credits before the completion of the degree.
- Students have the option of choosing any open Elective courses under the category of mandatory elective courses.
- A student is not eligible for more than one open Elective course under the category of mandatory courses.
- For UG and PG programs the Open Electives are offered within the regular class hours.
- These courses generally earn concern credits consisting of 8 weeks-12 weeks during the completion of semester.
- Students can view the complete details of the courses offered Elective courses in their course layout.
- Till a student finishes OEC under the mandatory course category, he/she is eligible to apply for other open elective courses.
- Evaluation pattern is the discretion of the faculty concerned for UG & PG courses will be with only end semester examinations
- Examinations are conducted by the departments concerned and the results are indicated only in Grades in the marks card.
- Minimum pass percentage is 40% for courses under the mandatory category. Grades are awarded only if the student passes.
- These courses are conducted after or before the regular class hours and the courses offered are different in Odd and Even semesters.

- Students are advised to finalize their choice of programs in consultation with their OEC coordinator.
- Minimum prescribed attendance for these courses is 85%. **Medical and co-curricular claim will be considered only if the student put in 75% physical attendance or the classes.**
- Attendance claim shall be submitted to OEC coordinator within 07 days after availing the leave.
- Students who fail to secure the minimum pass marks or required minimum attendance or who discontinue in between the course are required to register afresh. Re-registration is permitted only in the subsequent semester which may be for the same course or any other courses from the choices available during the particular semester.
- He / She submit course syllabus weekly report on the basis of that OEC co-ordinator conduct their continuous assessment.
- A student is not eligible to graduate without completing OEC mandatory course.
- OEC offered by other departments like Performing Arts, Industrial Automation, Industry 4.0, Vastushashtra, Sketching, Hotel Management, Film Making, Python programming, Theatre and Music etc.
- Each course admits only 40 students on a first-come-first-served basis. Courses which do not get minimum required applications may not be conducted.

The Department/Centre/Office of the activity/event concerned will set the relevant parameters to measure the content of each given criterion depending on the need and application of the particular activity/event and will assess the performance of every student objectively.

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
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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.

MGM UNIVERSITY, AURANGABAD
INSTITUTE OF BIOSCIENCES AND TECHNOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Sciences

Post Graduate (PG) programme

M.Sc. MICROBIOLOGY/ VIROLOGY - CURRICULUM

w. e. f. Academic Year 2021-22

M.Sc. Microbiology/ Virology IInd Year III Sem

SEMESTER-III

CURRICULUM

Semester III																		
Course code*	Course Title	Type	Teaching Scheme			Evaluation Scheme						Minimum Passing						Credit
						Internal			External			Total	Internal			External		
(Mandatory)			L	T	P	CA	MSE	TW	ESE	PR	CA		MSE	TW	ESE	PR	Total	
MMI-231	Medical Bacteriology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MMI-232	Environmental and Agricultural Microbiology	Theory	4			20	20		60		100	-	-	-	24	-	40	4
MVL-233	Experimental Microbiology Lab (Practical)	Practical			8			40		60	100	-	-	16		24	40	4
MVL-234	Major Project	Practical			8			80		120	200	-	-	32		48	80	4
MVL-235	Seminar	Practical			2			40		60	100	-	-	16		24	40	2
MVL-236	Blended Course	Practical			2			40		60	100	-	-	16		24	40	2
	Total		8		20	40	40	200	120	300	700	0	0	80	48	120	280	20

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, MSE- Mid Semester Examination, ESE- End Semester Examination, PR-Practical, TW-Term Work

MEDICAL BACTERIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI-231

Course Unit Title: Medical Bacteriology

Credits allocated: 4+0(4 Theory+0Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology/ Virology Masters of Science, 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.

Candidate should pass in Under Graduate Life Sciences.

Learning Outcomes: Upon successful completion, students will have the knowledge and skills to: History of Medical Microbiology, General characters, pathogenicity, epidemiology and laboratory, Identifying characters, morphological and cultural features, Study of important properties and clinical importance of microbes.

Objective: After completing this rotation, the intern will be able to: History of Medical Microbiology, General characters, pathogenicity, epidemiology and laboratory, Identifying characters, morphological and cultural features, Study of important properties and clinical importance of microbes

Detailed Syllabus

Theory

UNIT I

History of Medical Microbiology, Infections - Sources and classification, Mode of transmission of infections, Types of infectious diseases, Factors predisposing to microbial pathogenicity. Normal micro flora of human body, Human Microbiome, Human Microbiome Project

UNIT II

General characters, pathogenicity, epidemiology and laboratory identification of *Staphylococci*, *Streptococci* and *Neisseriae*, *Corynebacterium*, *Bacillus*, and *Clostridia*

UNIT III

General properties, morphological and cultural characters, pathogenicity, epidemiology and laboratory identification of *E.coli*, *Proteus*, *Klebsiella*, *Shigella*, *Salmonella*, *Pseudomonas*, *Haemophilus*, *Pasteurella*, *Yersinia*, *Francisella*, *Bordetella*, *Brucella* and *Vibrio*.

UNIT IV

Identifying characters, morphological and cultural features, pathogenicity, epidemiology and laboratory identification of Spirochetes, Mycoplasma, Rickettsiae, Chlamydiae, *M.tuberculosis*, *M.leprae*, and Non tuberculous mycobacteria.

UNIT V

Study of important properties and clinical importance of Actinomycetes- *Nocardia*, *Actinomyces*, General characters and clinical importance of *Listeria*, *Campylobacter*, *Helicobacter*, *Legionella*, *Acinetobacter*

SUGGESTED READINGS/ REFERENCE BOOKS/ TEXT BOOKS

1. J.G.Holt, (Ed) *Bergey's Manual of Systematic Bacteriology, Vol.1-4* (1984-1989) Williams and Wilkins, Baltimore.
2. Greenwood, D., Slack, R.C.B., Peutherer, J.F., and Barer, M.R. (2007). *Medical Microbiology : A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control*. Elsevier Health Sciences UK. 17th ed
3. Topley, W.W.C., Wilson, G.S., Parker, T., and Collier, L.H. (1990). *Topley and Wilson's Principles of Bacteriology, Virology and Immunology* (Edward Arnold)
4. Zinsser, H., and Joklik, W.K. (1992). *Zinsser microbiology* (Lange) 20th ed. 49
5. Ananthanarayan, R., and Paniker, C.K.J. (2006). *Textbook of microbiology*(Orient Blackswan) 7th ed

6. Mackie, T.J., McCartney, J.E., and Collee, J.G. (1989). *Mackie & McCartney practical medical microbiology*. Churchill Livingstone, 13th ed
7. Jawetz, E., Melnick, J.L., and Adelberg, E.A. (1987). *Review of medical microbiology* (Appleton & Lange)
8. Talaro, K.P., Cowan, M.K., and Chess, B. (2009). *Foundations in Microbiology* (McGraw-Hill Higher Education)
9. Page, R.D.M., and Holmes, E.C. (1998). *Molecular Evolution: A Phylogenetic Approach* Blackwell Science
10. Primrose, S.B. (1998). *Principles of genome analysis: a guide to mapping and sequencing DNA from different organisms* (Blackwell Science) 2nd ed
11. Adolph, K.W. (1996). *Microbial Genome Methods* CRC Press
12. Dunham, I. (2003). *Genome Mapping And Sequencing* (Horizon Scientific)
13. Brendan Wren (Ed), Nick Dorrell (2002) *Functional Microbial Genomics. Volume 33, Methods in Microbiology*, Academic Press, UK.\
14. Primrose, S.B., and Twyman, R. (2009). *Principles of Genome Analysis and Genomics* (John Wiley & Sons) 3rd ed.

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 4Marks-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

III. 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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI-232

Course Unit Title: Environmental and
Agricultural Microbiology

Credits allocated: 4+0(4 Theory+0Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology/ Virology Masters of Science, 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.

Candidate should pass in Under Graduate Life Sciences.

Learning Outcomes: Upon successful completion, students will have the knowledge and skills to: Aerobiology, Aquatic microbiology, Microbial flora of soil and factors affecting them, Microbial interaction etc.

Objective: The students will study the use of microorganisms for the value added products through fermentation processes. Further, they will learn and understand the composition of industrial waste water and xenobiotics, and their treatment using microorganisms.

Detailed Syllabus

Theory

UNIT I

Aerobiology, Microbial contamination of air, Sources of contamination, Microbial indicators of air pollution. Enumeration of bacteria in air, Air sampling devices. Air sanitation. Effect of Air Pollution on plants and humans.

UNIT II

Aquatic microbiology: Microbiology of water , Water pollution and water borne pathogens, Bacteriological examination of water, Indicator organisms. Purification and disinfection of water

Microbiology of sewage, Waste water treatment, BOD, COD. Role of microbes in marine fouling

UNIT III

Microbial flora of soil and factors affecting them, Key processes and role of microorganisms in Nitrogen, Carbon, Phosphorus, Sulphur and Iron cycles.

UNIT IV

Microbial interaction – Plant-microbe, microbe-microbe interactions. Endophytes, PGPR mechanisms of plant growth promotion by PGPR, Plant Microbiome, Mycorrhiza, Biological Nitrogen fixers-Symbiotic and free living nitrogen fixers- physiology and genetics of nitrogen fixers, Phosphate solubilizers, Phytopathogens – Bacterial, fungal, Viral diseases. (Wilt, Blight, Canker, Mosaic, Rhizome rot of ginger etc.) – Control measures. Biofertilizers, Microbial control of pests and diseases. Bt-toxin- mode of action and applications, Integrated pest management. GM crops and its importance

UNIT V

Recycling of liquid and solid wastes – Composting – Biogas – Biodegradation. Bioremediation, Bioleaching, Xenobiotic degradation. Microbial corrosion- Biofilms degradation of petroleum products. Microbes in mineral leaching and metal concentration, Microbial enhanced oil recovery

Suggested Readings / Reference Books / Text Books

1. Mitchell R (1974) *Introduction to environmental microbiology* (Prentice-Hall, Englewood Cliffs, N.J.,)
2. Atlas RM & Bartha R (1998) *Microbial ecology : fundamentals and applications* (Benjamin/Cummings, Menlo Park, Calif. ; Harlow) 4th ed.
3. Campbell RE (1983) *Microbial ecology* (Blackwell Scientific Publications, Oxford ; Boston) 2nd ed.
4. Rheinheimer G (1991) *Aquatic microbiology* (John Wiley and Sons) 4th ed. Dart RK (1980) *Microbiological aspects of pollution control* (Elsevier Scientific, Amsterdam) 2nd ed.
5. Alexander M (1977) *Introduction to soil microbiology* (Wiley, New York; London) 2nd ed.
6. Rao NSS (1995) *Soil microorganisms and plant growth* (Science Publishers, Inc.; New Hampshire, U.S.A) 3rd ed.

7. Pandey, B.P. (2001) *Plant Pathology : Pathogen and Plant Disease*. S.Chand & Co

8. Sharma, P.D. (2012) *Plant Pathology*. Rastogi publication

9. Rangaswami, G., Bagyaraj, D.J. (2007) *Agricultural Microbiology* 2nd edition

.Prentice Hall publishers

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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

EXPERIMENTAL MICROBIOLOGY

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-233

Course Unit Title: Experimental

Microbiology

Credits allocated: 0+4(0 Theory+4Practical)

Level of Study: PG

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

Recommended Year /Semester: Microbiology/ Virology Masters of Science, 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.

Learning Outcome: Students will appreciate the biological diversity of microbial forms and be able to describe/explain the processes used by microorganisms for their replication, survival, and interaction with their environment, hosts, and host populations. They will become aware of the important role microorganisms play in maintenance of a clean and healthy environment. They will learn of the role of microorganisms in plant, animal and human health and disease.

Objective: The study of microbes helps us to understand our world and our place within it. It gives us insights into the complexity of nature and society, which in turn provide many different health, environmental, social, cultural, industrial and economic benefits.

Practical List:

1. Isolation slime Molds
2. Isolation of Cynobacteria(blue green algae)
3. To perform acid fast staining
4. Isolation of *Azotobacter* from soil
5. Lethal effect of temp on micro-organisms TDP
6. Lethal effect of temp on micro-organisms TDT
7. Isolation of *rhizobia* from root nodules
8. Study of Phytoplankton microflora by leaf impression method
9. To perform staining gram staining for identification of bacteria by microflora by leaf impression method
10. To perform lactophenol cotton blue staining for identification of or fungi by microflora by leaf impression method
11. Effect of salt concentration on micro-organisms
12. Isolation of fungi by War cup method
13. To perform isolate bacteriophage from sewage sample
14. To determine biochemical oxygen demand
15. To determine COD of water sample
16. Estimation of urine by calibrate loop
17. Isolation of *S.aures* from milk sample
18. To perform catalase test
19. Microbial flora from teeth cervices
20. Isolation of dermatophytes & their identification
21. Isolation of DNA from bacteria

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.

Practical Assessment for 100 marks

Components(TW)	Record Book	Table Viva	Attendance	Total Marks
Internal Marks	10	10	20	40
External Assessment: Semester End Practical				60
Total Marks				100

- **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	14
2.	80	16
3.	90	18
4.	100	20

- **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.

MAJOR PROJECT

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-234

Course Unit Title: Major Project

Credits allocated: 0+4(0 Theory+4Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology/Virology, 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.

Candidates should pass in undergraduate Life Science.

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

Recommended Year /Semester: Industrial Microbiology, Year II/ Semester III

Course Outcomes:

1. Students will be able to practice acquired knowledge within the chosen area of technology for project development.
2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.

Detail syllabus

Project Assessment (200 Marks)

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
20	20	20	20	80
External Assessment				120
Total Marks				200

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.

Performance: Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. The criteria of it as given below.

1. Implementation:

Follows closely the design, uses appropriate techniques with skill and understanding to produce a good solution.

2. Evaluation:

Clearly relates solution to the problem. Shows a good understanding and appreciation of the solution. Objectives of what has been done.

3. Project Log:

- a. The individual student's effort and commitment.
- b. The quality of the work produced by the individual student.
- c. The student's integration and co-operation with the rest of the group.
- d. The completeness of the logbook & time to time signature of guide

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	14
2.	80	16
3.	90	18
4.	100	20

Project External Assessment (Marks distribution):120

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	20	20	20	40	20	120
Total marks						200

SEMINAR

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-235

Course Unit Title: Seminar

Credits allocated: 0+2(0 Theory+2Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology/ Virology 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.

Candidates should pass in undergraduate Life Science.

Course Outcomes:

1. The purpose of a seminar is to create an experience of working together.
2. One of the main objectives of conducting seminars is to avoid a passive experience everyone should have a way to contribute and communicate and also stage daring Improves.

Detail syllabus

Performance

Student performance is measured using grade point average (GPA), high school graduation rate, annual standardized tests and college entrance exams. A student's GPA is typically measured on a scale of zero to four with higher GPAs representing higher grades in the classroom.

Power Point Presentation

Slides help your listeners and move the toward your ideas ,Slideshows are quick to produce, easy to update and an effective way to inject visual interest into almost any presentation.

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.

SEMINAR ASSESMENT (Marks distribution): 100

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	7
10.	80	8
11.	90	9
12.	100	10

BLENDED COURSES

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-236

Course Unit Title: Blended Courses

Credits allocated: 0+2(0 Theory+2Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology/Virology 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.

Candidates should pass in undergraduate Life Science.

SOP for Blended Courses (PG I, II III & IV semester)

SOP for Blended Courses (PG I, II III & IV semester)

- 1) It is mandatory for post graduate students to undertake blended courses for concern credits before the completion of the degree.
- 2) Students have the option of choosing any blended courses under the category of mandatory elective courses.
- 3) Students are advised to finalize their choice of programs in consultation with their Blended course coordinator.
- 4) The course facilitator/mentor will conduct the whole course in consultation with Blended course coordinator.
- 5) For PG programs the blended are offered within the regular class hours.
- 6) These courses generally earn concern credits consisting of 1 Credit- 4 week 2 Credit-8 weeks 3-4 Credit -12 weeks during the completion of semester.
- 7) Students can view the complete details of the courses offered blended courses in their course layout.
- 8) Evaluation pattern is the discretion of the faculty concerned for PG courses will be with only end semester examinations
- 9) Examinations are conducted by the departments concerned and the results are indicated only in Grades in the marks card.
- 10) Minimum pass percentage is 40% for courses under the mandatory category. Grades are awarded only if the student passes.
- 11) These courses are conducted after or before the regular class hours and the courses offered are different in Odd and Even semesters.

- 12) Minimum prescribed attendance for these courses is 85%. Medical and co-curricular claim will be considered only if the student put in 75% physical attendance or the classes.
- 13) Attendance claim shall be submitted to blended course coordinator within 07 days after availing the leave.
- 14) Students who fail to secure the minimum pass marks or required minimum attendance or who discontinue in between the course are required to register afresh. Re-registration is permitted only in the subsequent semester which may be for the same course or any other courses from the choices available during the particular semester.
- 15) He / She submit course syllabus weekly report on the basis of that blended course co-ordinator conduct their continuous assessment.
- 16) A student is not eligible to graduate without completing OEC mandatory course.
- 17) The course platform for registration are SWAYAM NPTEL, Agmooc and Coursera.

The Department/Centre/Office of the activity/event concerned will set the relevant parameters to measure the content of each given criterion depending on the need and application of the particular activity/event and will assess the performance of every student objectively.

Assessment Method for Blended Courses (PG I, II III & IV semester)

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

MGM UNIVERSITY, AURANGABAD
INSTITUTE OF BIOSCIENCES AND TECHNOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Sciences

Post Graduate (PG) programme

M.Sc. MICROBIOLOGY/ VIROLOGY- CURRICULUM

w. e. f. Academic Year 2021-22

M.Sc. Microbiology/ Virology 1st yr IV Sem

SEMESTER-IV

CURRICULUM

Semester IV																		
Course code*	Course Title	Type	Teaching Scheme			Evaluation Scheme						Minimum Passing						Credit
						Internal			External			Internal			External			
						CA	MSE	TW	ESE	PR	Total	CA	MSE	TW	ESE	PR	Total	
(Mandatory)			L	T	P	CA	MSE	TW	ESE	PR	Total	CA	MSE	TW	ESE	PR	Total	Credit
MPB- 241	Ethics/ Biosafety/ IPR	Theory	4			20	20		60		100	-	-	-	24	-	40	4
PBL- 242	Big Idea	Pracitcal			20			80		120	200	-	-	32		48	80	10
PBL- 243	Blended Course	Pracitcal			2			40		60	100	-	-	16		24	40	2
	Total		4		22	20	20	120	60	180	400	0	0	48	24	72	160	16

L- Lecture, T-Tutorial, P-Practical, CA- Continuous Assessment, MSE- Mid Semester Examination, ESE- End Semester Examination, PR-Practical, TW-Term Work

SYLLABUS STRUCTURE SHEET

Ethics / Biosafety / IPR

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MMI-241

Course Unit Title: Ethics/ Biosafety/IPR

Credits allocated: 4+0(4 Theory+0Practical)

Level of Study: PG

Mode of delivery, planned learning activities and teaching method: Lecture 4 hrs weekly

Recommended Year /Semester: M.Sc. Microbiology/Virology, Year 2/ IV Semester

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

Candidate should pass in Under Graduate Life Sciences.

Outcomes: On completion of the course, students are able to understand

Explain the introduction, guidelines patent rights and systems

1. Biosafety: Introduction – biosafety issues in biotechnology - historical background.
2. Biosafety Guidelines
3. Intellectual Property Rights: Introduction to IPR, Types of IP
4. Patents And Patent Laws: Objectives of the patent system

Objective: To discuss about various aspects of biosafety regulations, IPR and bioethic concerns arising from the commercialization of biotech products.

Detailed Syllabus

Theory

UNIT I Biosafety: Introduction – biosafety issues in biotechnology - historical background. Biological Safety Cabinets, Primary Containment for Biohazards. Biosafety Levels - Levels of Specific Microorganisms, Infectious Agents and Infected Animals.

UNIT II Biosafety Guidelines: Guidelines and regulations (National and International including Cartagena Protocol) – operation of biosafety guidelines and regulations of Government of India; Definition of GMOs & LMOs. Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture. Environmental release of =GMOs - Risk - Analysis, Assessment, management and communication.

UNIT III Intellectual Property Rights: Introduction to IPR, Types of IP - Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge and Geographical Indications. Importance of IPR – patentable and non patentables, patenting life, legal protection of Biotechnological inventions. Agreements and Treaties - History of GATT & TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments. IPR and WTO regime - Consumer protection and plant genetic resources.

UNIT IV Patents And Patent Laws: Objectives of the patent system - Basic, principles and general requirements of patent law. Biotechnological inventions and patent law - Legal development - Patentable subjects and protection in Biotechnology. Patent Filing Procedures - National & PCT filing procedure, Time frame and cost, Status of the patent applications, Precautions while patenting, disclosure/ nondisclosure, financial assistance for patenting, introduction to existing schemes. Patent licensing and agreement. Patent infringement - meaning, scope, litigation, case studies.

UNIT V Bioethics: Introduction to ethics and bioethics, framework for ethical decision making. Ethical, legal and socioeconomic aspects of gene therapy, germ line, somatic, embryonic and adult stem cell research. Ethical implications of GM crops, GMO's, human genome project, human cloning, designer babies, biopiracy and biowarfare. Eugenics and its possible approaches. Animal right activities -Blue cross in India- society for prevention of cruelty against animals. Ethical limits of Animal use. Green peace - Human Rights and Responsibilities.

Recommended readings:

1. Beier F.K, Crespi R.S and Straus T. Biotechnology and Patent protection, Oxford and IBH Publishing Co. New Delhi.
2. Jeffrey M. Gimble, Academia to Biotechnology, Elsevier Academic Press.
3. Rajmohan Joshi (Ed.). 2006. Biosafety and Bioethics. Isha Books, Delhi.
4. Sasson A, Biotechnologies and Development, UNESCO Publications.

5. Senthil Kumar Sadasivam and Mohammed Jaabir M. S. (2008). IPR, Biosafety and Biotechnology Management, Jasen Publications, India.
6. Singh BD. 2007. Biotechnology: Expanding Horizon. Kalyani.
7. <http://patentoffice.nic.in>, 8. www.wipo.org9. www.dbtindia.nic.in10. www.dbtbiosafety.nic.in

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 4Marks-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

III.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.	70-80	7-8
2.	80-90	8-9
3.	90-100	9-10

SYLLABUS STRUCTURE SHEET

Big Idea

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-242

Course Unit Title: Big Idea

Credits allocated: 0+10(0 Theory+10Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology/Virology, Year 2/ IV Semester

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

Candidate should pass in Under Graduate Life Sciences.

Objective: To elaborate the procedure for Guiding Student projects

Responsibility:

Director

Project Head

All the Project Guide.

All Semester PG Students

Sr. no	Activities	Responsibility
1	UG students are to decide on their team members for their semester project with their proposed project domain and title.	B.Sc./ B.Tech./ M.S
2	Director shall allocate the Project Guide based on their area of expertise (not more than 3 batches to a Guide)	Director
3	Ensuring	
4	Verification of Student project log book.	Project Head and Project Guide.
5	Approval of PPT: Abstract, Existing, Proposed system. 30% of proposed work.80% of proposed work. 100% of proposed work.	Project Guide
6	Preparation and submission of progress report during project	Students, Project Head.
7	Preparing list for Redo students (Insufficient content, Plagiarism, poor presentation Genuine Absentees)	Project Heads
8	Submission of hard copy of Project report	Project Head
9	Ensuring that If a candidate fails to submit the project report on or before the specified deadline ,he/she is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester.	Project Head, Project Guide, Director

Project Assessment (200 Marks)

Idea of Project	Understanding of Subject	Literature survey	Attendance	Total Marks
20	20	20	20	80
External Assessment				120
Total Marks				200

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.

Performance:

Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. The criteria of it as given below.

1. Implementation:

Follows closely the design, uses appropriate techniques with skill and understanding to produce a good solution.

2. Evaluation:

Clearly relates solution to the problem. Shows a good understanding and appreciation of the solution. Objectives of what has been done.

3. Project Log:

- a. The individual student's effort and commitment.
- b. The quality of the work produced by the individual student.
- c. The student's integration and co-operation with the rest of the group.
- d. The completeness of the logbook & time to time signature of guide

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	14
2.	80	16
3.	90	18
4.	100	20

Project External Assessment (Marks distribution): 120

External Assessment: Semester End Project Examination						
Components	Project Report	PowerPoint Presentation	Viva Voce	Innovativeness	Individual Contribution	Total
	20	20	20	40	20	120
Total marks						200

BLENDED COURSES

University: MGM University, Aurangabad

Faculty: Basic & Applied Science

Institute: Institute of Biosciences and Tech.

Degree: M.Sc. M.Sc. Microbiology/Virology

Course Unit Code: MVL-243

Course Unit Title: Blended Courses

Credits allocated: 0+2(0 Theory+2Practical)

Level of Study: PG

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

Recommended Year /Semester: M.Sc. Microbiology/Virology 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.

Candidates should pass in undergraduate Life Science.

SOP for Blended Courses (PG I, II III & IV semester)

- 1) It is mandatory for post graduate students to undertake blended courses for concern credits before the completion of the degree.
- 2) Students have the option of choosing any blended courses under the category of mandatory elective courses.
- 3) Students are advised to finalize their choice of programs in consultation with their Blended course coordinator.
- 4) The course facilitator/mentor will conduct the whole course in consultation with Blended course coordinator.
- 5) For PG programs the blended are offered within the regular class hours.
- 6) These courses generally earn concern credits consisting of 1 Credit- 4 week 2 Credit-8 weeks 3-4 Credit -12 weeks during the completion of semester.
- 7) Students can view the complete details of the courses offered blended courses in their course layout.
- 8) Evaluation pattern is the discretion of the faculty concerned for PG courses will be with only end semester examinations
- 9) Examinations are conducted by the departments concerned and the results are indicated only in Grades in the marks card.
- 10) Minimum pass percentage is 40% for courses under the mandatory category. Grades are awarded only if the student passes.

- 11) These courses are conducted after or before the regular class hours and the courses offered are different in Odd and Even semesters.
- 12) Minimum prescribed attendance for these courses is 85%. Medical and co-curricular claim will be considered only if the student put in 75% physical attendance or the classes.
- 13) Attendance claim shall be submitted to blended course coordinator within 07 days after availing the leave.
- 14) Students who fail to secure the minimum pass marks or required minimum attendance or who discontinue in between the course are required to register afresh. Re-registration is permitted only in the subsequent semester which may be for the same course or any other courses from the choices available during the particular semester.
- 15) He / She submit course syllabus weekly report on the basis of that blended course co-ordinator conduct their continuous assessment.
- 16) A student is not eligible to graduate without completing OEC mandatory course.
- 17) The course platform for registration are SWAYAM NPTEL, Agmooc and Coursera.

The Department/Centre/Office of the activity/event concerned will set the relevant parameters to measure the content of each given criterion depending on the need and application of the particular activity/event and will assess the performance of every student objectively.

Assessment Method for Blended Courses (PG I, II III & IV semester)

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

III.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