

# Department of Microbiology

## Teaching Plan Academic Year 2019-2020

Teacher: Prof. K.R.Gaikwad

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**Class : B.Sc.F.Y [II Semester]**  
**Course Title : Basics of Microbiology and Biomolecules**  
**Course Code: U-MIB-252**

UNIT NO	UNIT NAME	UNIT CONTENT	FROM	TO	No. Of LECTURES
UNIT I	Ultra Structure of Bacterial Cell	1.1 Structure, Chemical composition and function of following:- a) Capsule and slimes b) Cell wall and cytoplasmic membranes c) Flagella and Motility, fimbriae and pili d) Nuclear material, Plasmids, Mesosome, , Ribosome e) Reserve materials and other cellular inclusions. f) Dormant forms of prokaryote: Endospore and cyst	09/12/19	11/01/20	15
UNIT II	The Viruses: Distribution and Structure	2.1) Viruses: history 2.2) General characteristics of viruses 2.3) Bacterial, plant and animal viruses 2.4) Multiplication of Virulent phage: The lytic cycle 2.5) The development of temperate phages: Lysogeny 2.6) Cultivation of viruses 2.7) viruses like agent : Viroids Prion, Satellites	13/01/20	03/02/20	10

<p><b>UNIT III</b></p>	<p><b>Biomolecules</b></p>	<p>3.1 Screening and strain development program, maintenance of stock culture.  3.2 Formulation of media, Development of Inoculum.  3.3 Sterilization of fermentation media bioreactors, Media.  3.4 Scale up of the fermentation process from shake flask to industrial level.  3.5 Solid state fermentation process.</p>	<p>04/02/20</p>	<p>25/02/20</p>	<p>10</p>
<p><b>UNIT IV</b></p>	<p><b>Functional and Informational Biomolecules</b></p>	<p>4.1 Downstream processes: Introduction,  4.2 Separation of particulates material- Filtration, Centrifugation, Sedimentation,  4.3 Emerging technologies for cell recovery,  4.4 Product isolation, Extraction, Solvent extraction, Aqueous two phase system, sorption, Precipitation, Reverse osmosis, Ultra filtration.  4.5 Recent trends in Product recovery:</p>	<p>29/02/20</p>	<p>21/03/20</p>	<p>10</p>

# Department of Microbiology

## Teaching Plan Academic Year 2019-2020

Teacher: Prof. K.R.Gaikwad

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**Class : B.Sc.S.Y [III Semester]**

**Course Title : Environmental Microbiology**

**Course Code: U-MIB-459**

UNIT NO	UNIT NAME	UNIT CONTENT	FROM	TO	No. Of LECTURES
UNIT I	<b>Microbial Ecology and Interactions</b>	<p>1.2 Microbial ecology: Ecosystem, Synecology, Autecology, population, community (Autochthonous, Allochthonous), Dispersal (Center, Active, Passive), Community succession (Pioneer, Successive, Climax), Adaptation (Phenotypic, Genotypic)</p> <p>1.3 Symbiosis: Definition and functions</p> <p>1.4 Types of symbiosis: neutralism, Commensalism, Mutualism (Lichens, Mycorrhiza) Competition, Antibiosis, Synergism, and Parasitism. (Definition and example of each)</p>	12/12/19	08/01/20	11
UNIT II	<b>Plant Growth Promoting Rhizobacteria</b>	<p>2.1 Rhizosphere</p> <p>2.2 Direct plant growth promotion:</p> <p>i) Releasing plant growth promoting substances: Indoleacetic acid, gibberellic acid, cytokines, ethylene and ACC deaminase</p> <p>ii) Decreasing heavy metal toxicity.</p> <p>2.2 Indirect plant growth promotion – Biocontrol:</p> <p>i) Competition for an ecological niche,</p> <p>ii) Suppression of growth of soil-born phytopathogens by producing allelochemicals</p> <p>iii) Induction of systemic resistance (ISR)</p>	09/01/20	05/02/20	11

UNIT NO	UNIT NAME	UNIT CONTENT	FROM	TO	No. Of LECTURES
UNIT III	The Cycles of Matter	1.5 Soil as growth medium for microorganisms: Physical and chemical considerations, Organic fraction of soil 1.6 Carbon cycle: Cycle, Mineralization- cellulose, Starch (Microbiology and enzymology), Carbon assimilation 1.7 Nitrogen cycle: Cycle, Nitrogen fixation(Symbiotic, Non symbiotic, Nitrogenase), Mineralization of proteins, Ammonification, Nitrification, Denitrification 1.8 Sulfur cycle 1.9 Phosphorus cycle.	06/02/20	11/03/20	13
UNIT IV	Soil Contamination and Bioremediation	4.1 Soil contamination- Xenobiotics 4.2 Bioremediation: Definition and principles 4.3 Microbial Populations for Bioremediation Processes 4.4 Types of Bioremediation: <i>In situ</i> bioremediation, <i>Ex situ</i> bioremediation 4.5 Advantages and disadvantages of Bioremediation	12/03/20	09/04/20	10

# Department of Microbiology

## Teaching Plan Academic Year 2019-2020

Teacher: Prof. K.R.Gaikwad

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**Class : M.Sc.F.Y [III Semester]**

**Course Title : Enzyme Technology**

**Course Code: P-ENZ-282**

UNIT NO	UNIT NAME	UNIT CONTENT	FROM	TO	No. Of LECTURES
UNIT I	<b>Enzyme as a Biocatalyst and Enzyme Engineering</b>	1.1 Active site, 1.2 Co-enzymes: Structure and functions with suitable examples, Metallo enzymes and Metal ions as co-factors and enzyme activators. 1.4 Mechanism of enzyme action- with reference to chymotrypsin. 1.5 Chemical modification of enzymes 1.6 Application of Site directed mutagenesis to study structure –function relationship of enzyme.	09/12/19	24/12/19	10
Unit II	<b>Enzyme Kinetics and Enzyme Inhibition</b>	2.1 Enzyme kinetics: Steady state kinetics, Brigs Haldane equation, Michaelis Menten equation, The Monod-Wyman-Changeux (MWC) Model, the Koshland-Nemethy-Filmer (KNF) Model. 2.2 Enzyme inhibition-Reversible and Irreversible inhibition, competitive, noncompetitive and uncompetitive inhibition,with suitable example and their kinetics studies. 2.3 Enzyme regulation-Allosteric regulation, Types of allosteric regulation and their significance in metabolic regulation and their kinetics study (Hills equation).	26/12/19	16/01/20	11

UNIT NO	UNIT NAME	UNIT CONTENT	FROM	TO	No. Of LECTURES
UNIT III	<b>Extraction and Purification of Microbial Enzyme</b>	3.1 Importance of Enzyme purification. 3.2 Different sources of enzyme, Extracellular and Intracellular enzyme, Physical and Chemical methods used for cell disintegration. 3.3 Enzyme fractionation by precipitation (using Temperature, Salt, pH etc.), 3.4 Enzyme purification by Liquid-liquid extraction, Dialysis, Ionic Exchange, Gel electrophoresis, Affinity chromatography and other special purification methods. 3.4 Enzyme crystallization technique, Criteria of purity of enzyme, Pitfalls in working with pure enzyme.	17/01/20	06/02/20	12
Unit IV	<b>Immobilization and Applications of Microbial enzymes</b>	4.1 Properties of Immobilized enzyme, 4.2 Methods of immobilization: Adsorption, Covalent bonding, Entrapment and Membrane confinement. 4.3 Analytical, Therapeutic and Industrial applications of immobilized enzymes. 4.4 Microbial enzymes in Textiles, Leather, Wood Industries and Detergent, Enzymes in clinical diagnosis, 4.5 Enzyme sensors for clinical processes and environment analysis, 4.6 Enzymes as therapeutic agents, Extremozymes, Solventogenic enzymes.	10/02/20	03/03/20	12

