

# Department of Microbiology

## Teaching Plan Academic Year 2019-2020

Teacher: Dr. D.V. Vedpathak

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**Class : B.Sc.F.Y [II Semester]**  
**Course Title : Microbial Nutrition and Growth**  
**Course Code: U-MIB-253**

| UNIT NO | UNIT NAME           | UNIT CONTENT   | FROM     | TO       | No. Of LECTURES |
|---------|---------------------|--|----------|----------|-----------------|
| UNIT I  | Microbial Nutrition | 1.1 Major bio-elements, minor bio-elements and growth factors<br>1.2 Sources of energy<br>1.3 Nutritional categories of microorganisms on the basis of carbon and energy source.   | 11-12-19 | 03-01-20 | 10              |
| UNIT II | Nutrient Transport  | 2.1 Modes of nutrition: osmotrophic, phagotrophic<br>2.2 Nutrient transport and membrane function: primary and secondary transport, porins, OMP, carrier proteins<br>2.3 Passive diffusion<br>2.4 Facilitated diffusion<br>2.5 Active transport mechanism<br>2.6 Group translocation | 08-01-20 | 30-01-20 | 12              |

|                 |  |  |          |          |    |
|-----------------|--|--|----------|----------|----|
| <b>UNIT III</b> | Bacterial Reproduction and Growth                                | 3.1 Microbial Reproduction – Binary fission, Budding, fragmentation and formation of conidiophores<br>3.2 New cell formation (Macromolecular synthesis, septum formation)<br>3.3 Definition of growth and growth phases<br>3.4 The mathematical nature and expression of growth, generation time<br>3.5 Measurement of growth: cell number, cell mass, cell activity<br>3.6 Different types of bacterial cultures – Batch culture, continuous culture, synchronous culture | 06-02-20 | 19-02-20 | 11 |
| <b>UNIT IV</b>  | Effect of environmental factors on microbial growth and survival | 4.1 Environmental factors affecting growth - temperature, pH, osmotic pressure, oxygen, hydrostatic pressure, heavy metals<br>4.2 Survival of bacteria-Bacterial sporulation and cyst formation  | 12-03-20 | 15-04-20 | 12 |

Note: 5 to 8 Extra Lectures are required

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**Class : B.Sc.T.Y [II Semester]**

**Course Title : Molecular Biology-XI**

**Course Code: U-MIB-665**

| UNIT NO | UNIT NAME                                  | UNIT CONTENT  | FROM     | TO       | No. Of LECTURES |
|---------|--|---|----------|----------|-----------------|
| UNIT I  | DNA: Structure, replication and properties | 1.1Structure<br>1.2Replication<br>1.3DNA methylation in prokaryotes<br>1.4Properties: physical, chemical, spectral and thermal<br>1.5Stability of DNA and its information content                               | 16-10-12 | 07-01-20 | 10L             |
| UNIT II | Genes and genetic code                     | 2.1 genome, plasmone<br>2.2 Genes, Recon, muton, cistron<br>2.3 Genes within a Genome, Genome size and complexity,<br>2.4 Genome organization: <i>E. coli</i> ,<br><i>Saccharomyces</i> and T4 genes and genome | 11-01-20 | 01-02-20 | 10L             |

|                 |                        |  |          |          |            |
|-----------------|------------------------|--|----------|----------|------------|
| <b>UNIT III</b> | <b>Gene Expression</b> | 3.1 Transcription: Structure of RNA Polymerase (RNAP), Structure of mRNA and the Process of transcription<br>3.2 Characteristics of Genetic code: (Triplet code, comma free, non-overlapping, degenerate, start and stop signals and wobble hypothesis)<br>3.3 Translation: Structure of Ribosomes, t-RNA and the Process of Translation<br>3.4 Regulation of gene Expression:<br>i) The <i>lac</i> Operon of <i>E. coli</i><br>ii) The <i>trp</i> Operon of <i>E. coli</i>  | 03-02-20 | 24-02-20 | <b>10L</b> |
| <b>UNIT IV</b>  | <b>Gene cloning</b>    | 4.1 Introduction, Definition and Purpose of Cloning<br>4.2 Outline of gene cloning procedure (shotgun method)<br>4.3 Insertion of target DNA into vector: Cohesive end ligation, blunt end ligation, homopolymer tailing, use of linkers and adaptors<br>4.4 Gel Electrophoresis<br>4.5 Methods of gene transfer: CaCl <sub>2</sub> Transformation, Electroporation, Liposome fusion, Transfection<br>4.6 Screening Strategies (In brief)<br>i. Insertional inactivation<br>ii. Immunochemical methods<br>iii. Colony hybridization<br>4.8 Applications of gene cloning<br>i. cDNA cloning of human insulin gene in <i>E.coli</i><br>ii. Bt cotton | 25-02-20 | 18-04-20 | <b>15L</b> |

Note: 10 to 12 Extra Lectures are Required.

# Department of Microbiology

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Teacher: Dr. D.V. Vedpathak

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**Class : B.Sc.F.Y [II Semester]**  
**Course Title : Modern Microbial Genetics-VIII**  
**Course Code: P-MIG-281**

| UNIT NO | UNIT NAME  | UNIT CONTENT  | FROM     | TO       | No. Of LECTURES |
|---------|--|---|----------|----------|-----------------|
| UNIT I  | <b>Bacterial DNA Replication, Damage and Repair</b>    | Unit of replication, Enzymes involved in replication origin and replication fork, Fidelity of replication, Extrachromosomal replicon.<br>Types of damage: Spontaneous damage, Thermal damage, Damage due to radiation, Oxidative damage, Hydrolytic damage, Alkylation, DNA damaging agents.<br>DNA repair pathways: Damage reversal, Base Excision repair, Nucleotide excision repair, Methyl directed mismatch repair, Very short patch repair, Recombination repair, SOS system. | 16-12-19 | 02-01-20 | 10              |
| UNIT II | <b>Bacterial Transcription and Translation Process</b> | Structure of RNA polymerase (RNAP), Transcription factors, Structure and Functions of different types of RNA, Promoter structure, Transcription cycle and Fidelity of transcription.<br>Structure of ribosomes, Genetic code, Initiation complex, Activation and functioning of tRNA, Translation cycle, Polysomes, Post-translational modifications (PTMs) and Recycling.  | 06-12-19 | 23-01-20 | 12              |

|                 |  |  |          |          |    |
|-----------------|--|--|----------|----------|----|
| <b>UNIT III</b> | <b>Regulation of Gene Expression in Bacteria</b>     | <p>Common modes of regulation: Co-ordinate regulation, Auto regulation, Negative and</p> <p>Positive regulation, stringent response, Lac operon, Trp operon, Arabinose operon.</p> <p>Transcriptional regulation: Regulation by repressors and activators, Alternative sigma factors, Regulation of RNAP activity, Regulation of transcription termination (regulation by attenuation).</p> <p>Translational regulation: Regulation at the level of initiation, Elongation and Termination.</p> <p>Regulation of gene expression in bacteriophages</p> <p>Introduction to Quorum-sensing</p> <p>Regulation of Gene Expression in bacteria.</p> | 27-01-20 | 13-02-20 | 12 |
| <b>UNIT IV</b>  | <b>Genetic Recombination and Mapping in Bacteria</b> | <p>Background and perspectives of Genetic Recombination. Introduction to different types of genetic maps.</p> <p>Molecular mechanism of gene transfer and genetic mapping by:</p> <ol style="list-style-type: none"> <li>Co-transformation in Transformation,</li> <li>Interrupted Mating and Time-of-Entry in Conjugation,</li> <li>Linkage maps by breakage and re-joining in Transduction</li> <li>Use of Transposons in Genetic Mapping.</li> </ol>  | 12-03-20 | 01-04-20 | 11 |