SAURASHTRA UNIVERSITY  
FACULTY OF SCIENCE  
CBCS BASED COURSE STRUCTURE FOR SEMESTER 1 TO 6 & SYLLABUS FOR SEMESTER 3 & 4 FOR UNDERGRADUATE PROGRAMME IN MICROBIOLOGY TO BE EFFECTIVE FROM JUNE 2019 AND JUNE 2020 RESPECTIVELY

<table>
<thead>
<tr>
<th>No.</th>
<th>Diploma/Graduate/Post Graduate</th>
<th>Semest er</th>
<th>Title Of Paper</th>
<th>Paper No.</th>
<th>Credits</th>
<th>Internal Marks</th>
<th>External Marks</th>
<th>Practi cal &amp; Viva Marks</th>
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<td>01</td>
<td>Introduction to Biotechnology and Cell Biology</td>
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BT-301 –METABOLISM OF BIOMOLECULES
(THEORY)

Unit-1:-ENZYME
1.1 Enzymes: - General properties, Nomenclature and Classification. Biocatalyst and Chemical Catalyst, Coenzymes, Cofactors, Isoenzyme and Allosteric Enzyme
1.2 Catalytic Mechanism (Proximity and Orientation effects, Acid base Catalysis, Covalent Catalysis and Metal ion catalysis and Transition state analog)
1.3 Enzyme Kinetics (derivation of Michaelis–Menten constant, linear transformation of the equation)
1.4 Enzyme Inhibition: Mechanism and Types (Irreversible and Reversible)
1.5 Mechanism of Enzyme Regulation: Covalent and Allosteric Regulation

UNIT-2:-METABOLISM - 1
2.1 Carbohydrate Metabolism: Glycolysis, fate of pyruvate
2.2 Carbohydrate Metabolism: TCA
2.3 Carbohydrate Metabolism: Gluconeogenesis and HMP
2.4 Lipid Metabolism: β-oxidation of fatty acids
2.5 ETC and Oxidative Phosphorylation

UNIT-3:-METABOLISM - 2
3.1 Protein Metabolism: Transamination, Decarboxylation and Deamination
3.2 Protein Metabolism: Urea Cycle
3.3 Biosynthesis of Nucleic Acid
3.4 Photosynthesis
3.5 Inborn Errors of Metabolism (Phenylketonuria, Alkaptonuria, Albinism, Sickle Cell Anemia and Galactosemia)

UNIT-4:-HORMONES
4.1 Introduction to Hormones: Endocrine and Exocrine
4.2 Plant Hormones and its functions
4.3 Animal Hormones and its functions
4.4 Types of Animal Hormones
4.5 Disorders due to hormonal imbalance in humans

UNIT-5:- MOLECULAR TRANSPORTATION AND SIGNALING(credit-0.8)
5.1 Composition and architecture of membrane
5.2 Solute transport across membrane
5.3 Signal transduction cascade
5.4 Regulation of cell cycle by protein kinase
5.5 Role of signal transduction by hormones

LIST OF PRACTICALS
Exp.1. To demonstrate working operations of spectrophotometer.
Exp.2. Estimation of Protein by Biuret method.
Exp. 3. Estimation of Reducing Sugar by Nelson- Somogyi method

Exp. 4, 5, 6 Assaying of various enzymes (any three):
   a) Amylases by KI-I2 method.
   b) Phenol oxidase (Potato).
   c) Phosphatases
   d) Urease.
   e) Invertase by GOD/POD and DNSA method.
   f) Proteolytic enzymes (Trypsin or Pepsin).
   g) Lipases (Germinating castor seeds).

Exp. 7, 8, 9, 10 Enzyme Kinetics:
   a) Effect of Substrate concentration (Determination of Km and Vmax).
   b) Effect of temperature on enzyme activity
   c) Effect of pH on enzyme activity
   d) Effect of Enzyme inhibitors on enzyme activity

Exp. 11 One day Field visit.

**LIST OF INSTRUMENTS**

1. pH Meter
2. Hot Air Oven
3. Weigh Balance
4. Water Bath
5. Refrigerator
6. Autoclave
7. Spectrophotometer and/or Colorimeter
8. Incubator
9. Stirrer
10. Centrifuge
11. Vortex

**LIST OF REFERENCES**

5. U Satyanarayan, Biochemistry, 3rd Edn, Books and Allied Pvt. Ltd.
20. A.V.S.S. Rama Rao, A Text book of Biochemistry, , UBS Publisher
27. Practical manuals of Biotechnology, S. Chand

P.S. The above reference book list are common for all the unit

BT-401–ENVIRONMENTAL BIOTECHNOLOGY AND BIOSTATISTICS (THEORY)
Unit 1: Ecosystem and its component (credit-0.8)
1.1 Terrestrial Biomes: - Deserts, Grasslands, Tundra & Forests
1.2 Aquatic Biomes: Freshwater & Saline Ecosystem
1.3 Biodiversity: - Factors affecting biodiversity, Biodiversity conservation
1.4 Interaction within, between & among populations
1.5 Population Ecology, Population characteristics, Models of population growth and Interactions

Unit 2: Environmental pollutions and its remedies (credit-0.8)
2.1 Diversity of metabolic processes among bacteria
2.2 Overview: Biodegradation of Hydrocarbon & Xenobiotics
2.3 Biodegradation of DDT, Nitrobenzene
2.4 An overview of process of Bioremediation & Biomagnification
2.5 Conventional Air Pollutants & Acid rain & Acid mine drainage

Unit 3: Microbial Application in Environment (credit-0.8)
3.1 Physical, Chemical & Biological properties of water and waste-water
3.2 Primary, Secondary and Tertiary treatment processes
3.3 Treatment of solid wastes (Anaerobic digestion and composting)
3.4 Biofertilizers and Biocontrol
3.5 Bioleaching and Bioplastics

Unit 4: Basics and concepts of Biostatistics (Credit - 0.8)
4.1 Scope and applications of Biostatistics
4.2 Samples and population concept, Collection, Processing and Presentation of data
4.3 Frequency distribution
4.4 Measures of Central tendency - Arithmetic, Harmonic and Geometric Mean, Mode and Median, their applications, merits and demerits
4.5 Measures of dispersion - Range, Variance, Standard Deviation, Coefficient of Variance, their applications, merits and demerits

Unit – 5: Statistical tests in Biology (Credit - 0.8)
5.1 Inferential statistics
5.2 Student’s t-test: Paired and Unpaired
5.3 Analysis of Variance
5.4 Regression and Correlation analysis
5.5 Chi-square test

LIST OF PRACTICALS
Exp. 1. Physical parameters of waste water (Color, Turbidity, Odor, pH, TS, TDS and TSS estimation)
Exp. 2. NH₄-N Estimation
Exp. 3. NO₂⁻-N Estimation and NO₃⁻-N Estimation
Exp. 4. Chloride Estimation
Exp. 5. Ca-Mg Hardness
Exp. 6. Phosphorus Phosphate Estimation
Exp. 7. Dissolved oxygen (DO)
Exp. 8. Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)
Exp. 9. Bacteriological analysis by MPN technique
Exp. 10. Biostatistics examples:
   a. Calculation of Mean, Standard Deviation and Coefficient of Variance
   b. Frequency distribution graphs and curves
   c. Value of confidence limit for the population mean
   d. Significant test: Student’s t-test for paired and unpaired data
   e. Chi-square test
   f. Analysis of variance (ANOVA) - Randomized Block Design (RBD)
   g. Regression coefficient and Correlation coefficient
Exp. 11. One day Field visit

**LIST OF INSTRUMENTS**

1. pH Meter
2. Hot Air Oven
3. Weigh Balance
4. Water Bath
5. Refrigerator
6. Incubator
7. BOD Incubator
8. Autoclave
9. UV Spectrophotometer and Colorimeter
10. COD Apparatus
11. Incubator
12. Stirrer
13. Vortex
LIST OF REFERENCES

4. Saras Publication, Biostatistics applications
6. Manoj Tiwari & Kapil Khulbe, Environmental studies, IK International
8. H. R. Singh, Environmental Biology, S. Chand Pub.
13. K. Omasa, Pollution & Plant Biotechnology, Springer Int Edn
14. Indu Shekhar Thakur, Environmental Biotechnology, IK International
15. William P. Cunningham, Environmental Science, McGraw Hill
16. Pradipta Kumar Mohapatra, Textbook of Environmental Biotechnology, IK Int.
17. A. Mackenzie, Instant notes in Ecology, Viva books Pvt Ltd
18. Rajvaidhya, Environmental Biochemistry, APH Pub
20. Bitton, Wastewater Microbiology - 2 ed, Wiley
21. Purohit Shammi, Environmental Sciences, Student Edi
22. Eugene Odum, Ecology, Oxford
23. Gerba & Pepler, Environment microbiology
25. APHA. Water and Wastewater analysis.

P.S. The above reference book list are common for all the unit