

BHAKTA KAVI NARSINH MEHTA UNIVERSITY



**COURSE STRUCTURE & SYLLABUS
FOR UNDERGRADUATE PROGRAMME
IN
BIOTECHNOLOGY**

[As per Choice Based Credit System (CBCS) as recommended by UGC]

Effective from June - 2019

SEMESTER III

BT-301 –METABOLISM OF BIOMOLECULES (THEORY)

Unit-1:- ENZYME (credit-0.8)

- 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(credit-0.8)

- 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(credit-0.8)

- 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

UNIT-4:- HORMONES(credit-0.8)

- 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. Estimation of Nucleic Acid (DNA and RNA)
- Exp. 5, 6, 7 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.8, 9, 10 Enzyme Kinetics:
- a) Effect of Substrate concentration (Determination of K_m and V_{max}).
 - b) Effect of pH and temperature on enzyme activity
 - c) 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

1. Lehninger. Principles of Biochemistry, Nelson & Cox, 4th Edition.
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3. Mathews, Van Holde, Biochemistry, 3rd Edition Pearson Education.
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5. U Satyanarayan, Biochemistry, 3rd Edn, Books and Allied Pvt. Ltd.
6. Salisbury and Rose, Plant Physiology, 4th Edn, Wadsworth Pub.
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17. Elliott & Elliot.3rd Edition Biochemistry and molecular biology.
18. Seidman and Moore. 2000. Basic laboratory methods for biotechnology. Longman
19. Boyer, Concepts in biochemistry. Thomson
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21. S.R. Thimmaiah, Standard methods in Biochemical Analysis, Kalayani Pub.
22. Sawhney and Randhir Singh, Introductory Practical Biochemistry, Narosa Pub.
23. BeeduSashidar Rao & Vijay Deshpande, Experimental Biochemistry, I K Int. Pvt. Ltd.
24. Plumner. An introduction to practical Biochemistry,3rd Edition
25. J.Jayraman. Lab Manual in Biochemistry.
26. Biotechnology, U. Satyanarayan, Books and Alllied
27. Practical manuals of Biotechnology, S. Chand

SEMESTER IV

BT-401–ENVIRONMENTAL BIOTECHNOLOGY AND BIOSTATISTICS (THEORY)

Unit 1:- Ecosystem and its component (credit-0.8)

- 1.1 Terrestrial Biomes: - Deserts, Grasslands, Tundra & Forests and Aquatic Biomes: Freshwater & Saline Ecosystem
- 1.2 Biogeochemical Cycles: Nitrogen, Carbon & Sulfur cycle
- 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:- Biostatistics - 1 (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 Biostatistics - 2 (credit-0.8)

- 5.1 Correlation analysis and Regression analysis: Linear, Bivariate regression analysis
- 5.2 Probability and Conditional probability, Theoretical distributions- Binomial and Poisson distribution and their Properties; Normal distribution and its properties, Skewness and kurtosis
- 5.3 Student's t-test- introduction and application in biology
- 5.4 Chi square test- introduction and application in biology
- 5.5 Analysis of variance- introduction and application in biology

LIST OF PRACTICALS

- Exp. 1. Physical parameters of waste water (Color, Turbidity, Odor, pH,TS, TDS and TSS Estimation)
- Exp. 2. $\text{NH}_4\text{-N}$ Estimation
- Exp. 3. $\text{NO}_2\text{-N}$ Estimation and $\text{NO}_3\text{-N}$ 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

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2. P.S.S.Sundar Rao, An Introduction to Biostatistics, Eastern Economy Edition.
3. N.Gurumani, An Introduction to Biostatistics, 2nd Edition, MJP Publisher.
4. Saras Publication, Biostatistics applications
5. Wayne W. Daniel, Biostatistics: a foundation for analysis in the health sciences. Wiley & Sons
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