



Pithapur Rajah's Government College (Autonomous) Kakinada

Program
& Semester
I B.Sc
Semester -II

Course Code	BIOMOLECULES AND ANALYTICAL TECHNIQUES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

LEARNING OUTCOMES

On successful completion of the course, the students will be able to

1. Learn about classification, structure and properties of Carbohydrates, Proteins and Lipids.
2. Learn about structure and function of DNA, RNA, Vitamins and Bioenergetics.
3. Learn about basic principles of Centrifugation, Chromatography and Electrophoresis.
4. Learn about principles of Spectroscopy, Microscopy and Techniques.
5. Learn about basics of Biostatistics.

II. Syllabus

Unit-I-Carbohydrates, Protein and Lipids

- 1.1 Carbohydrates - Classification, structure of any one Monosaccharide, Disaccharide, Polysaccharide. Properties of Monosaccharides.
- 1.2 Proteins – Structure of amino acids, peptide bond, Structure (primary, secondary, tertiary, quaternary) and proteins.
- 1.3 Lipids – Fatty acids (Unsaturated and saturated), Classification lipids.

Unit-II- Nucleic acid and Bioenergetics

- 2.1 Structure of DNA and RNA.
- 2.2 Free energy, entropy, enthalpy, and redox potential.
- 2.3 High energy compounds.

Unit-III-Centrifugation, Chromatography, and Electrophoresis

- 3.1 Centrifugation - Basic principles of sedimentation and types of centrifugations.
- 3.2 Chromatography – Partition Coefficient, Principle, instrumentation, and application of paper, ion exchange chromatography.
- 3.3 Basic principles and types of electrophoresis, . PAGE(Native, SDS-PAGE).

Unit - IV-Spectroscopy, Microscopy and Laser Techniques

4.1 Spectroscopy - Beer-Lambert law, Instrumentation and applications of UV-visible spectrophotometer.

4.2 Types and design of microscopes - Compound, Electron microscopy (TEM, SEM).

4.3 Introduction to radioisotopes, measurement of radioactivity (scintillation counter)

Unit -V- Biostatistics

5.1 Probability

5.2 Tests of significance - Chi-square test

5.3 One-way ANOVA.

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. learn about basic instruments and their operation
2. learn about Qualitative and Quantitative analysis of carbohydrates
3. Learn about estimations nucleic acids and protein by various methods
4. learn about the separation of molecules by chromatography and electrophoresis
5. Learn about problems on mean median mode



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Teaching	Hours Allocated: 45 (Lab)	L	T	P	C
Pre-requisites:		-	-	2	1

1. Introduction to basic instruments (Principle standard operation procedure) demonstration and record
2. Calculation of molarity, normality, and molecular weight of compounds.
3. Qualitative analysis of carbohydrates (sugars)
4. Quantitative analysis of carbohydrates
5. Quantitative estimation of protein - Lowery method
6. Estimation of DNA by diphenylamine reagent
7. Estimation of RNA by orcinol reagent
8. Assay of protease activity
9. Preparation of starch from potato and its hydrolyze by salivary amylase
10. Preparation of standard buffer and pH determination
11. Separation of amino acids by paper chromatography
12. Separation of lipids of TLC
13. Agarose gel electrophoresis
14. Calculation of mean, median and mode

REFERENCES

1. Outlines of Biochemistry, 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons, USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffery Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H. Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley and Sons, Inc. USA
5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H. Freeman and Company, NY
6. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu. Pvt.Ltd. New Delhi, India
7. Biochemical Methods, 1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India
8. Textbook of Biochemistry with Clinical Correlations, 7th Edition, (2010), Thomas M. Devlin; John Wiley and Sons, USA
9. Proteins: biotechnology and biochemistry, 1st edition, (2001), Gary Walsch; Wiley, USA



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Course Code	MICROBIOLOGY, CELL BIOLOGY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

LEARNING OUTCOMES

On successful completion of the course, the students will be able to

1. Learn about Scope and Techniques of Microbiology.
2. Learn about concept of Microbial species and strains,
3. Learn about cell structure and function.
4. Learn about cell signaling and control mechanisms.
5. Learn about genome organization of prokaryotic and eukaryotic organisms

Syllabus

Unit-I- Scope and Techniques of Microbiology

1.1 History and contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming.

1.2 Ultrastructure of bacteria and growth curve. Pure culture techniques.

1.3 Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Simple, gram and acid-fast staining.

Unit-II-Microbial Taxonomy and Metabolism

2.1 Concepts of microbial species and strains. Classification of bacteria based on morphology, nutrition and environment. General characteristics of viruses.

2.2 Structure and properties of plant (tobacco mosaic virus, TMV), human (Human immunodeficiency virus, HIV). Structure, infection, diagnosis and treatment of SARS- CoV 2

2.3 Introduction to fungi, algae and mycoplasma.

Unit-III- Cell Structure and Functions

3.1 Structure, properties and functions of cellular organelles (E.R, Golgi bodies, Mitochondria, Ribosomes, lysosomes, nucleus) of eukaryotic cells.

3.2 Cell cycle and its regulation

3.3 Cell division – mitosis, meiosis

Unit-IV- CELL SIGNALLING

4.1 Chemical composition and dynamic nature of the membrane

4.2 Cell Surface Receptors

4.3 Cell signaling and communication (GPCR, cAMP, cGMP, IP3, DAG)

Unit – V - Central Dogma of Molecular Biology

5.1 Mutations – Types of mutations

5.2 DNA Damage

5.3 DNA repair Mechanism – Excision repair – BER and NER

Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about preparation of media for culturing of various microorganisms
2. Learn about isolation of microorganisms from different sources
3. Learn about staining techniques and biochemical identification of bacteria
4. Learn about different stages of cell division



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Teaching	Hours Allocated: 40 (Theory)			
	L	T	P	C
Pre-requisites:	-	-	2	1

1. Cleaning and preparation of glassware
2. Preparation of nutrient agar medium for bacteria
3. Preparation of PDA medium for fungi
4. Sterilization techniques (autoclave, hot air oven, filter)
5. Isolation of bacteria from soil
6. Simple staining technique
7. Differential staining technique
8. Microbial counting by Haemocytometer
9. Identification of different bacteria
10. Motility test by hanging drop
11. Biochemical identification of bacteria
12. Preparation of pure culture by slab, slant, streak culture
13. Study of stages of cell division
14. Extraction and isolation of DNA from bacteria

REFERENCES

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3. Textbook of Microbiology, Anantnarayan and Paniker (2017)
4. Brock biology of microorganisms, 2003, Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J.; Upper Saddle River (NJ): Prentice-Hall, 2003.
5. Genes XI, 11th edition, (2012), Benjamin Lewin; Publisher - Jones and Barlett Inc. USA
6. Molecular Biology of the Gene, 6th Edition, (2008), James D. Watson, J. D., Baker T.A., Bell,