

**Government College for Men (A), KADAPA  
Department of Biotechnology**

**SEMESTER-II (W.E.F. 2023-24)**

**COURSE 1: BIOMOLECULES AND ANALYTICAL TECHNIQUES**

Theory Credits: 3

3 hrs/week

**Course 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 and Microscopy
4. Learn about basic principles of Chromatography and Electrophoresis which are used in purification and analysis.
5. Learn about principles of Spectroscopy, and Tracer Techniques which are used in quantification, detection and analysis.

**Unit-I-Carbohydrates, Protein and Lipids**

1. Classification, structure, properties of carbohydrates, amino acids, peptide bond and peptides.
2. Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins.  
Denaturation and renaturation of proteins.
3. Classification structure and properties of saturated and unsaturated fatty acids.

**Unit-II- Nucleic acid, Vitamins, and Bioenergetics**

1. Structure and functions of DNA and RNA.
2. Source, structure, biological role, and deficiency manifestation of vitamin A, B, C, D, E, and K. Free energy, entropy, enthalpy, and redox potential.
3. High energy compounds, Electron-Transport System and Oxidative Phosphorylation.

**Unit-III- Centrifugation and Microscopy**

1. Structure of light Microscope, working principle and applications of light, phase-contrast, fluorescent microscopy.
2. Structure of electron Microscope, working principle and applications of SEM and TEM. Comparison between optical and electron microscope, limitations of electron microscopy.
3. Basic principles of sedimentation and types of centrifugations

**Unit -IV Chromatography and Electrophoresis**

1. Principle, instrumentation, and application of partition, absorption, paper, TLC, ion exchange, gel permeation, and affinity chromatography.
2. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE), Agarose gel electrophoresis. Introduction to 2D & Isoelectric Focusing.

**Unit - V-Spectroscopy and Tracer Techniques**

1. Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and

- application of photoelectric colorimeter
2. Double beam and dual wavelength UV-Vis Spectrophotometer, Introduction to crystallography and application.
  3. Introduction to radioisotopes, measurement of radioactivity (scintillation counter and autoradiography)

### III . Skills Outcome

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

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3. Learn about basic. principles of Centrifugation and Microscopy
4. Learn about basic principles of Chromatography and Electrophoresis which are used in purification and analysis.
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