

BIOINSTRUMENTATION

| Semester | Subject code | Category | Lecture | | Theory | | P | C |
|----------|--------------|-----------------|----------------|----|----------------|----|---|---|
| VI | 21CBT6C | Core Theory - X | 5 hrs per week | 75 | 5 hrs per week | 75 | 0 | 4 |

Course Objective:

- ✓ To provide fundamental theoretical knowledge to the students with an adequate number of analytical tools about bioinstruments, biomethods, its principle and operation methods.

COURSE OUTCOMES: By the end of this course, students will able to:

| CO NUMBER | CO STATEMENT | KNOWLEDGE LEVEL (K1-K4) |
|-----------|---|--------------------------|
| CO1. | To understand the concepts of microscopy and centrifugation | K2 |
| CO2. | To learn, apply and analyze the samples using centrifugation Techniques. | K4 |
| CO3. | Understand the principles and types of chromatography | K2 |
| CO4. | To analyze and interpret the data obtained using Spectrophotometric methods and NMR | K3 |
| CO5. | To evaluate genetic problems by various electrophoretic techniques | K1 & K3 |

Knowledge Level: K1- Remember, K2- Understand, K3- Apply, K4-analyze

MAPPING WITH PROGRAMME OUTCOMES

| COS | PO1 | PO2 | PO3 | PO4 | PO5 |
|-----|-----|-----|-----|-----|-----|
| CO1 | S | M | S | L | L |
| CO2 | S | M | S | S | S |
| CO3 | M | S | S | M | M |
| CO4 | M | M | S | M | M |
| CO5 | M | S | S | M | S |

S-strong; M- medium; L-low

UNIT-I CENTRIFUGATION TECHNIQUES

15 Hours

Centrifugation techniques: Basic Principles, Rate of sedimentation, Types of centrifuges- Microfuges, small desk top centrifuges, High speed centrifuges, Ultracentrifuges.

Preparative centrifugation- Differential centrifugation, Density gradient centrifugation- Rate zonal Centrifugation, Isopycnic centrifugation. Applications of centrifugation techniques.

UNIT-II CHROMATOGRAPHY

15 Hours

Chromatography: Basic principle, source, detectors and applications of Paper Chromatography, Thin Layer Chromatography, Gas Chromatography, Column chromatography, Gel filtration chromatography, High-Pressure Liquid Chromatography, Ion Exchange Chromatography, Size-Exclusion Chromatography.

UNIT- III SPECTROPHOTOMETER

15 Hours

Spectral Methods of Analysis: Beer-Lambert Law, Colorimeters: UV-Visible Spectrophotometers, Single And Double Beam Instruments, Sources And Detectors, FT-IR Spectrophotometers.

UNIT IV NUCLEAR MAGNETIC RESONANCE

15 Hours

NMR: Basic Principles, NMR Spectrometer and Applications. Electron Spin Resonance Spectroscopy: Basic Principles, Instrumentation and Applications

UNIT – V ELECTROPHORETIC TECHNIQUES

15 Hours

Electrophoresis- Introduction, SDS-PAGE, Native –PAGE, pulse field gel electrophoresis, immuno-electrophoresis, isoelectric focusing, Agarose gel electrophoresis, Western Blotting, Southern Blotting.

Distribution of Marks: Theory 80% and Problems 20%

TEACHING METHODOLOGY:

- Class room teaching
- Assignments
- Discussions
- Homework
- PPT presentations
- Seminars
- Models and charts

TEXT BOOKS:

| S.NO. | AUTHORS | TITLE | PUBLISHERS | YEAR OF PUBLICATION |
|-------|--|--|---|---------------------|
| 1. | Wilson.K., Walker.J. E.J., Wood.K. | Principles & of techniques practical biochemistry | Cambridge University Press | 2000 |
| 2. | Veerakumari.L | Bioinstrumentation | Mjp Publishers, 1 st edition. | 2011 |
| 3. | John Denis Enderle | Bioinstrumentation | Morgan & Claypool Publisher | 2006 |
| 4. | Shakti Chatterjee and Aubert Miller | Biomedical instrumentation Systems | Cengage Learning | 2012 |
| 5. | Jon B. Olansen and Eric Rosow | Virtual Bioinstrumentation | Pearson Education | 2001 |

REFERENCE BOOKS:

| S.NO. | AUTHORS | TITLE | PUBLISHERS | YEAR OF PUBLICATION |
|-------|--|--|--------------------------------|---------------------|
| 1. | John.G Webster | Bioinstrumentation | John Wiley & Sons, New York | 2004 |
| 2. | Robert D. Braun | Introduction to Instrumental Analysis | McGraw Hill, Singapore | 1987 |
| 3. | Veerakumari L | Bioinstrumentation | MJP Publishers | 2009 |
| 4. | Shakti Chatterjee and Aubert Miller | Biomedical instrumentation systems | Cengage Learning | 2012 |
| 5. | Andrew G. Webb | Principles of Biomedical Instrumentation | Cambridge University Press | 2018 |

WEB SOURCES:

1. <https://www.hccfl.edu/media/572066/microscopy.pdf>
2. <http://www.biologydiscussion.com/biochemistry/chromatography-techniques/top-12-types-of-chromatographic-techniques-biochemistry/12730>
3. <https://www.labcompare.com/Spectroscopy/105-Spectrophotometers/>
4. <https://www.oregonstatehospital.net/d/otherfiles/Electron%20Spin%20Resonance%20Spectroscopy.pdf>
5. <https://nptel.ac.in/courses/102103013/17>
6. <https://www.amazon.com/Principles-Biomedical-Instrumentation-Cambridge>

Syllabus Designer:

- Dr.J.Ilamathi
Assistant Professor