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|---------------------------------|-----------------------------------------------------------------|
| <b>Subject Code: 2SC2000204</b> | <b>Subject Title: Instrumentation and analytical techniques</b> |
| <b>COURSE TYPE: CORE COURSE</b> |                                                                 |

**Course Objective:** The objective of the course is to introduce the students to the concepts of physical principles of detection and measurement systems. Emphasis will also be given to understand the principles of major experimental techniques applied to understand these physical problems. The course will cover theoretical aspects and applications of modern analytical techniques in Modern Biology.

| Teaching scheme (hours) per week |           | Credit |           |       | Theory Marks    |                  | Practical Marks |                  | Total |
|----------------------------------|-----------|--------|-----------|-------|-----------------|------------------|-----------------|------------------|-------|
| Theory                           | Practical | Theory | Practical | Total | Uni. Assessment | Cont. Assessment | Uni. Assessment | Cont. Assessment |       |
| 4                                | -         | 4      | -         | 4     | 60              | 40               | -               | -                | 100   |

| Unit | Content                                                                                                                                                                                                                                                                                                                                               | Lectures | Weightage |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|
| 1    | <ul style="list-style-type: none"> <li>Light, phase contrast, fluorescence microscopy.</li> <li>Scanning and transmission electron microscopy.</li> <li>Atomic force microscopy.</li> <li>Confocal microscopy.</li> <li>Concept of adsorption, auxochrome and chromophore</li> </ul>                                                                  | 08       | 15%       |
| 2    | <ul style="list-style-type: none"> <li>X ray diffraction, fluorescence, UV -Visible, IR, NMR and ESR</li> <li>Atomic absorption and plasma emission spectroscopy</li> <li>Mass spectroscopy.</li> <li>Gel- filtration, ion-exchange, affinity chromatography, TLC, HPTLC</li> <li>GC, HPLC, FPLC</li> <li>Concept of plates and Numericals</li> </ul> | 25       | 40%       |
| 3    | <ul style="list-style-type: none"> <li>Electrophoresis- Agarose and PAGE, SDS-PAGE.</li> <li>Pulse gel and 2D gel electrophoresis, iso-electric focusing (IEF).</li> <li>Basic principle and application of Centrifugation.</li> <li>Types of Centrifugation: Differential, density gradient and Ultracentrifugation.</li> </ul>                      | 12       | 20%       |
| 4    | <ul style="list-style-type: none"> <li>Radiolotopes in Biology; Production of Isotopes.</li> <li>Principle and applications of tracer technique in biology.</li> <li>Fundamentals of Geiger and liquid scintillation radioactivity counters.</li> <li>Biosensors and their applications.</li> </ul>                                                   | 15       | 25%       |

**Learning Outcome:** Students will learn the principles and applications of different analytical techniques. They will also learn the core aspects of instrumentation involved in conducting experimental research in the fields of Microbiology and Biotechnology.

**LIST OF TEXTBOOKS:**

1. Upadhyay, Upadhyay, Nath – Biophysical Chemistry
2. Willard and Merritt, Instrumental method of analysis
3. Pelczar et al., fifth edition, Microbiology
4. Prescott et al, fifth edition, Microbiology
5. Sharma B K, Instrumental method of chemical analysis
6. D.A. Skoog, Instrumental methods of analysis
7. Plumner, An introduction to practical Biochemistry
8. Chatwal and Anand, Instrumentation
9. Boyer, Modern experimental Biology