

|                              |                                    |
|------------------------------|------------------------------------|
| <b>Branch Name:</b>          | M.Sc. Biotechnology / Microbiology |
| <b>Program Code:</b>         | SC201 / SC202                      |
| <b>Course Name:</b>          | Practical Module -II               |
| <b>Course Code:</b>          | 3SC2000205                         |
| <b>Pre-requisite Course:</b> |                                    |

**Course Objectives:**

- To develop proficiency in research methodology, including abstract writing, literature review, questionnaire design, and data handling using statistical tools.
- To impart practical skills in microbiological, serological, and hematological techniques relevant to clinical and industrial applications.
- To provide hands-on training in nanotechnology and applied microbiology, including synthesis, characterization, and antimicrobial evaluation.
- To enhance understanding of quality control, environmental microbiology, and bioenergy applications, including sterility testing, microbial analysis, and biogas production.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |              |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|----------------------------------|--------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)                      | Tutorial (T) | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                                  |              |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| --                               | --           | 16            | 8      | --                        | --                    | 100                   | 100                   | 200           |

**List of Experiments:**

- Abstract writing from the given research paper
- Designing a Questionnaire
- Secondary Data Collection Exercise
- Data Entry and Processing using EXCEL
- Data Classification and Tabulation
- Basic Statistical Analysis in EXCEL
- Literature Review Writing (5-10 research papers)
- Culture techniques: Streak plate, Spread plate, Pour plate, Use of selective and differential media
- Serological tests: Widal, Agglutination
- Hematological tests: CBC, ESR
- Antibiotic Sensitivity Testing: Disc diffusion and Broth dilution methods
- Visit to any diagnostic laboratory for demonstration of RT-PCR
- Synthesis of Nanoparticles by Physical/Chemical/Biological Methods
- Characterization of Nanoparticles (Size, Shape, and Surface Properties)
- Antimicrobial Activity of Nanoparticles (Zone of Inhibition Test)
- Antibiotic sensitivity assay

- Microbial examination of Non-sterile products
- Sterility testing of different locations of production area and packaging area
- To check the effect of preservative in different formulations
- To check the effect of disinfectant
- Phosphate Uptake Experiment.
- Fungal Flora Isolation
- Isolation of Skin Microflora
- Detection of Microbial Life (simulated life experiment)
- Biogas Production Experiment.

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                                                                                                             | Bloom's Taxonomy Level                          |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| CLO1 | Explain principles of research methodology, microbiological techniques, diagnostic assays, and nanoparticle synthesis and characterization.                             | 1 Remember<br>2 Understand                      |
| CLO2 | Perform data collection, tabulation, statistical analysis (using Excel), and standard microbiological and clinical laboratory techniques.                               | 2 Understand<br>3 Apply<br>4 Analyze            |
| CLO3 | Interpret results of antibiotic sensitivity tests, serological and hematological assays, and antimicrobial activity of nanoparticles.                                   | 2 Understand<br>3 Apply 4 Analyze<br>5 Evaluate |
| CLO4 | Conduct and evaluate microbial quality control tests, including sterility testing, preservative efficacy, disinfectant action, and examination of non-sterile products. | 2 Understand<br>3 Apply<br>4 Analyze            |
| CLO5 | Assess experimental outcomes in environmental and applied microbiology, such as microbial diversity, phosphate uptake, and biogas production processes.                 | 2 Understand<br>3 Apply 4 Analyze<br>5 Evaluate |
| CLO6 | Design and present scientific outputs, including abstracts, literature reviews, datasets, and experimental reports integrating laboratory and field observations.       | 3 Apply 4 Analyze<br>5 Evaluate<br>6 Create     |

### Mapping of CLO s with POs & PSOs

| Course Learning Outcomes | Programme Outcomes (POs) |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | Programme Specific Outcome (PSOs) |      |      |
|--------------------------|--------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|-----------------------------------|------|------|
|                          | 1                        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PSO1                              | PSO2 | PSO3 |
| CLO1                     | 2                        | 3 | 1 | 2 | 3 | 2 |   |   | 2 | 1  |    | 2  | 1  |    |    |    |                                   |      | 1    |
| CLO2                     | 3                        | 2 |   | 1 | 3 | 3 | 1 |   | 2 | 3  |    | 1  | 2  |    |    |    | 1                                 | 2    | 1    |
| CLO3                     | 3                        | 3 | 1 | 1 | 3 | 2 |   |   | 2 | 1  |    | 1  | 2  |    |    |    |                                   |      |      |
| CLO4                     | 3                        | 2 |   | 1 | 3 | 3 | 1 |   | 2 | 2  |    | 3  | 3  | 2  |    |    |                                   |      |      |
| CLO5                     | 3                        | 3 | 2 | 1 | 3 | 2 |   |   | 2 | 1  | 1  | 2  | 2  | 3  | 1  | 1  |                                   |      |      |
| CLO6                     | 2                        | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 2  | 1  | 2  | 3  | 1  | 1  | 1  | 1                                 | 1    | 2    |

**3: High, 2: Medium, 1: Low**