Microbiology-Enzymatic Catalysis

1. **Course number and name:** 020MCECS3 Microbiology- Enzymatic Catalysis

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of instructor:** -

4. **Instructional materials:**
   - PowerPoint slides

5. **Specific course information**

   a. **Catalog description:**
   Introduction and history. Ultrastructure and morphology. Bacterial systematics. Growth and physiology. Bacteria/host relationship. Bacterial genetics. Antibiotics/antiseptics. Introduction: nucleic acid structure, restriction enzymes. Different types of RNA. Transcription in eukaryotes and prokaryotes. Post-transcriptional modifications in eukaryotes and prokaryotes. Transcriptional regulation. Ribozymes. Genetic code and translation in eukaryotes and prokaryotes. Post-translational modifications. Replication. Sequencing. Different molecular biology tools. Introduction to biotechnology. Enzymatic processes: kinetic laws, trends in industrial enzymology, models of starch hydrolysis processes. Processes with immobilized enzymes and cells: immobilized enzyme technology, fixed cell technology.

   b. **Prerequisites:** None

   c. **Required/ Selected Elective/Open Elective:** Selected Elective

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**

   By the end of this course, students will be able to:
   - Describe bacterial morphology, systematics, and physiology, and explain their relevance in host-pathogen interactions.
   - Explain the principles of bacterial genetics, including gene expression, mutation, and horizontal gene transfer.
   - Compare molecular mechanisms in eukaryotic and prokaryotic cells (transcription, translation, replication).
   - Analyze the role and regulation of nucleic acids, RNA types, ribozymes, and post-transcriptional modifications.
   - Identify and explain key molecular biology tools such as restriction enzymes, sequencing methods, and genetic engineering techniques.
   - Understand the structure, function, and kinetics of enzymes, and describe their use in industrial and biotechnological processes.
   - Evaluate biotechnological applications of enzyme and cell immobilization in biochemical engineering systems.
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   b. **PIs addressed by the course:**

PI	7.1	7.2
Covered	x	x
Assessed	x	x

7. Brief list of topics to be covered

- Introduction to microbiology and molecular biology
- Bacterial ultrastructure, morphology, and classification
- Bacterial growth, physiology, and host-pathogen relationships
- Bacterial genetics: conjugation, transduction, transformation
- Introduction to nucleic acids, restriction enzymes, and RNA types
- Transcription and translation in prokaryotes and eukaryotes
- Post-transcriptional and post-translational modifications
- Genetic code, ribozymes, and gene regulation
- Replication and sequencing techniques
- Overview of molecular biology tools and their applications
- Introduction to biotechnology: genetic engineering, applications
- Enzyme kinetics: Michaelis-Menten laws, industrial relevance
- Trends in industrial enzymology and hydrolysis of starch
- Immobilized enzyme and cell-based bioprocesses