<table>
<tr><th colspan="5">NATIONALLY HARMONISED B.Sc. CHEMICAL ENGINEERING PROGRAM</th></tr>
<tr><td>Course Code</td><td colspan="4">ChEg3124</td></tr>
<tr><td>Course Name</td><td colspan="4">Introduction to Biochemical Engineering</td></tr>
<tr><td>Degree Program</td><td colspan="4">B.Sc. in Chemical Engineering</td></tr>
<tr><td>Module Name</td><td colspan="4">Reaction and Biochemical Engineering</td></tr>
<tr><td>Module Coordinator</td><td colspan="4">N.N.</td></tr>
<tr><td>Lecturer</td><td colspan="4">N.N.</td></tr>
<tr><td>Instructor’s Contact Information</td><td colspan="4">Office:
Phone:
Email:
Office hour:</td></tr>
<tr><td>ECTS Credits</td><td colspan="4">5CP</td></tr>
<tr><td rowspan="2">Student work load per Week</td><td>Lecture</td><td>Tutorial</td><td>Lab/ practice</td><td>Home study</td></tr>
<tr><td>3</td><td>2</td><td>0</td><td>3</td></tr>
<tr><td>Student work load per semester</td><td>48</td><td>32</td><td>0</td><td>48</td></tr>
<tr><td>Mode of Delivery</td><td colspan="4">Parallel (Semester wise)</td></tr>
<tr><td>Course Objectives & Competences to be Acquired</td><td colspan="4">This course has the objective of acquainting the students with typical biochemical processes, enzyme kinetics and industrial application, cell kinetics and fermenter design.

Upon completion of the course, the students will able to
✓ explain uses of major industrial enzymes & enzyme reactor designs
✓ exercise on biomass production and application
✓ design bio process and biochemical processes, and
✓ Use bio-organisms on chemical processes</td></tr>
<tr><td>Course Description/Course Contents</td><td colspan="4">1. Biotechnology and Biochemical Engineering
➢ Applications of Biotechnology
➢ Typical Biological Processes
2. Enzyme Kinetics
➢ Commercial Applications of Enzymes
➢ Simple Enzyme Kinetics</td></tr>
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	➢ Evaluation of Kinetic Parameters ➢ Enzyme Reactor with Simple Kinetics ➢ Inhibition of Enzyme Reactions and Other influences on Enzyme Activity 3. Immobilized Enzyme ➢ Immobilization Techniques ➢ Effect of Mass-Transfer Resistance 4. Industrial Applications of Enzymes ➢ Carbohydrates ➢ Starch Conversion ➢ Cellulose Conversion 5. Cell Kinetics and Fermenter Design ➢ Growth Cycle for Batch Cultivation ➢ Stirred-tank Fermenter ➢ Multiple Fermenters Connected in Series ➢ Cell Recycling ➢ Alternative Fermenters ➢ Structured Model 6. Sterilization ➢ Sterilization Methods ➢ Thermal Death Kinetics ➢ Design Criterion ➢ Batch, Continuous and Air Sterilization 7. Agitation and Aeration ➢ Basic Mass-Transfer Concepts ➢ Correlation for Mass-Transfer Coefficient ➢ Shear-Sensitive Mixing 8. Downstream Processing ➢ Solid-Liquid Separation ➢ Cell Rupture ➢ Recovery and Purification
Pre-requisites	ChEg3121 (Reaction Engineering I)
Semester	Year III, semester II
Status of Course	Compulsory
Teaching & Learning Methods	Classroom contact/Lecture, group work, interactive tutorial sessions (group and pair work/discussions) and individual work (independent learning)
Assessment/Evaluation	Continuous assessment ----------50% • Quizzes ---------- 10% • Assignments ---------- 15% • Group works----------15% • Tests ----------10%

	Final exam----------50%
Course Policy	**Attendance**: As per the harmonized academic policy **Assessments**: Students are supposed to handle all the assessments on time. **Cheating/ Plagiarism**: It is strictly forbidden and any miss conduct is accountable as per the students code of conduct.
Literature	**Text Book:** 1. James Lee, Biochemical Engineering, prentice hall, 2ed, 1992 **Reference Books:** **2.** Baily James E and Olli's David F; Biochemical Engineering Fundamentals
Approval Section	**Module team/ Course chair**