**School of Chemical and Bio Engineering**

**Addis Ababa Institute of Technology**

**Addis Ababa University**

**Course Name: Introduction to Biochemical Engineering**

**Course Code: CBEg 4192 ECTS: 5**

**Academic Year: 2020 (2012 E.C) For 4th Year, Semester II Instructors: Lidya D.**

**Course objectives**:

The course will introduce typical biochemical process, enzyme kinetics and industrial application, cell kinetics and fermenter design.

**Learning Outcomes:**

Upon the completion of this course, the students should be able to understand:

* Enzyme applications and kinetics
* Factors affecting biological reactions
* Able to explain cell kinetics and design fermenter
* Agitation and aeration mechanisms and their effects on microbial
* Post product processing: sterilization, recovery and purification

**Course contents**

**1. Biotechnology and Biochemical Engineering**

* Applications of Biotechnology
* Typical Biological Processes

**2. Enzyme Kinetics**

* Commercial Applications of Enzymes
* Simple Enzyme Kinetics
* 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

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**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

**Attendance Requirements: -** At least 75% of lectures

**Assessment/Evaluation System**

Assignment/ Project work 10%

Random Quiz 5%

Test 30%

Laboratory 15%

Final Exam 40%

**Reference books**

1. Lee James M: Biochemical Engineering (Text)

2. Baily James E and Ollis David F; Biochemical Engineering Fundamentals

3. T. Schäfer · T.V. Borchert; Advanced in Biochemical Engineering/Biotechnology.

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