Mechanical Agitation and Transfer

1. **Course number and name:** 020AMTCS4 Mechanical Agitation and Transfer

2. **Credits and contact hours:** 2 ECTS credits, 1x1:15 contact hours

3. **Name of instructors:** Jihane Rahbani

4. **Instructional materials:**
   - Course handouts
   - In class problems
   - References: Chemical Process Equipment Selection and Design - Stanley M. Walas-Butterworth-Heinemann Series in Chemical Engineering.

5. **Specific course information**
   a. **Catalog description:**
   This course focuses on mechanical agitation and mass transfer principles in bioreactors, with an in-depth exploration of stirred aerated reactors. Key topics include the hydrodynamic constraints in mechanical mixing, the impact of agitation on transfer rates, and the modeling and extrapolation of fermentation processes. Students will gain a comprehensive understanding of how mechanical agitation influences bioreactor performance and the overall efficiency of fermentation.

   b. **Prerequisites:** 020PDTCS2 Mass Transfer

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

6. **Specific goals for the course**

   a. **Specific outcomes of instruction:**
   At the end of this course, students will be able to
   - Identify and describe various types of bioreactors, including aerated agitated reactors, and understand their applications in different industries.
   - Comprehend hydrodynamic constraints in aerated agitated reactors: Students should gain knowledge about the hydrodynamic factors that affect the performance of aerated agitated reactors, such as mixing, oxygen transfer, and mass transfer. They should be able to analyze and evaluate the impact of these constraints on reactor design and operation.
   - Develop modeling skills for fermentation processes: Students should learn the principles of modeling fermentation processes and be able to apply mathematical models to predict and optimize fermentation outcomes. They should understand the key parameters and variables involved in fermentation modeling.
   - Apply extrapolation techniques in fermentation: Students should be able to extrapolate fermentation data and make predictions for larger-scale processes. They should understand the challenges and considerations involved in scaling up fermentation processes and be able to apply appropriate techniques for accurate extrapolation.

   b. **PIs addressed by the course:**

PI	1.1	1.2	1.3	2.1	2.2	2.3
Covered	x	x	x	x	x	x
Assessed	x	x	x	x	x	x

7. Brief list of topics to be covered

Chapter I Types of bioreactors
Chapter II Aerated agitated reactor: hydrodynamic constraints
Chapter III Modeling and extrapolation of fermentation