Subject Description Form

Subject Code	ABCT4777
Subject Title	CHEMICAL & BIOPROCESS TECHNOLOGY
Credit Value	3
Level	4
Pre-requisite	INTRODUCTION TO CHEMICAL & BIOPROCESS TECHNOLOGY
Objectives	To introduce the general chemical & bioprocess engineering principles, with a focus on the common processes and operations in the chemical and bioprocess industry.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand the theoretical principles and practical considerations for design and operation of chemical and biological processes, and the engineering approaches to deriving the design equations for complex processes. b. design and predict the major process parameters in chemical, biochemical and separation processes. c. use and analyze experimental data to derive the kinetic and process parameters with simple computing techniques.
Subject Synopsis/ Indicative Syllabus	Chemical Reactors and Bioreactors Batch reactor and continuous stirred tank reactor (CSTR); fixed and fluidized beds. Batch growth (fermentation) kinetics; continuous bioreactor (chemostat); fed-batch process. Bioprocesses and bioreactors Batch growth kinetics; continuous stirred-tank bioreactor (chemostat); practical considerations for choice of processes; Bioreactor mixing and mass (O2) transfer. Principles of mass transfer; Mass transfer concepts: molecular diffusion and convective mass transfer, convective mass transfer coefficients; gas-liquid two phase transfer, oxygen transfer in bioreactors. Product Recovery and Purification Evaporation, crystallization and drying; Mass transfer operations: extraction, gas absorption, fractional distillation.
Teaching/Learning Methodology	**Lectures:** to introduce the essential contents, to elaborate the major principles, concepts and relationships and processing units. Practical examples and problems will be used to illustrate the principles. **Tutorials** (in smaller groups): to make further explanation/clarification of the major points and difficult/problematic contents, to apply the concepts and principles in problems and exercises, and to have more interactive and effective contact and discussion with the students. **After class:** homework assignments and exercises will be given to students. **On-line resources:** a subject web will be set up and used as a teaching aid.

<table>
<tr><td></td><td>Detail answers/solution manuals are provided to the students for most of the assignment, test and examination questions.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td></td><td></td><td></td></tr>
<tr><td>1. Final exam</td><td>60</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>2. Course work</td><td>40</td><td>√</td><td>√</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Learning outcomes will be assessed continually through written assignments, tests and exams. The connection of these assessments to the learning outcomes will be stated explicitly to the students.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorials</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and revising</td><td>56 Hrs.</td></tr>
<tr><td>▪ Exercises & assignments</td><td>32 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>127 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>
1. Geankoplis C J Transport Processes and Unit Operations, 4th Edition Prentice-Hall PTR 2003
2. Fogler HS, Elements of Chemical Reaction Engineering, 2nd-4th ed. 1992-2006.
3. Doran P: Bioprocess Engineering Principles, Academic Press, 1998
4. Shuler M & Kargi F: Bioprocess Engineering, Basic Concepts, Prentice Hall, 2002.
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