Subject Description Form

Subject Code	ABCT247
Subject Title	INTRODUCTION TO CHEMICAL & BIOPROCESS TECHNOLOGY
Credit Value	3
Level	II
Pre-requisite / Co-requisite/ Exclusion	None
Objectives	To provide the basic knowledge of the common processes and equipment in chemical, biotechnology and other related industries, and to introduce the basic principles of chemical and bioprocess engineering, with particular emphasis on the quantitative expression of process conditions and material properties, and the calculation of material and energy balances, and heat transfer.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) demonstrate the general process formats for manufacture of chemical and biochemical products, and recognize the functions of process units for the processing of raw materials and products; b) grasp the basic concepts of common separation processes, and their applications for separation and purification of chemical and biological products, and for removal of pollutants from water, air, and wastes; c) apply the elementary chemical engineering principles to analyze and solve material and energy balance problems, and to quantify the material and energy requirements in chemical, biochemical and related processes.
Subject Synopsis/ Indicative Syllabus	<u>Basic concepts of process technology (12 hrs)</u> The composition and layout of common processes in the chemical, biotechnology and other related industries such as food and pharmaceutical processes, including the major process units and operations, and their functions; various process strategies such as batch, continuous processes and their modifications. <u>Quantification of process variables and conditions (6 hrs)</u> Common scientific unit systems and unit conversion; measurement and quantitative representation of process variables, conditions and material properties such as temperature, pressure, viscosity and mixture composition. <u>Material balances (9 hrs)</u> Material balances for separation (unit operations), chemical and biochemical reaction processes, and other natural and industrial processes; product yield in biological processes and oxygen balance in bioreactors. <u>Energy balances (6 hrs)</u> Thermodynamic properties of liquids and gases, enthalpy change in systems with and without phase transition, and heats of reaction; heat and enthalpy balances for physical and reactive processes.

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<tr><td></td><td>Heat transfer (6 hrs)
Basics means of heat transfer: conduction, convection and radiation; calculation of heat transfer through solid and fluid media, and heat transfer coefficients; common heat-transfer equipment or heat exchangers; heat transfer and temperature control in bioreactors.

Evaporation (3 hrs)
The principles of evaporation: heat transfer, energy and energy balances; common industrial evaporators; evaporation of chemical and bio- products.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. Lectures and tutorials.
2. Exercises, assignments and tests.
3. Questions, consultation and discussion.
4. T/L aids: power point slides, handouts, subject web, and reference books.</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>
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<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:
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<tr><td>Student Study Effort Required</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>28 Hrs.</td></tr>
<tr><td>▪ Tutorials</td><td>14 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>88 Hrs.</td></tr>
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</td></tr>
<tr><td>Reading List and References</td><td>1. Geankoplis C J: Transport Processes and Unit Operations, 3rd ed. Prentice Hall 1993.
2. Doran PM: Bioprocess Engineering Principles, Harcourt Brace & Company, 1998.
3. Felder R M & Rousseau RW: Elementary Principles of Chemical Processes, 2nd ed. John Wiley & Sons 1996.
4. Himmelblau D M: Basic Principles and Calculations in Chemical Engineering, 5th/6th ed. Prentice Hall 1989/1996.</td></tr>
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