Subject Description Form

Subject Code	ABCT3403
Subject Title	ELEMENTS OF FOOD ENGINEERING
Credit Value	3
Level	3
Pre-requisite	University Physics I (AP10008) or Physics I (AP10005)
Co-requisite	Calculus and Linear Algebra (AMA1007)
Exclusion	Nil
Objectives	This subject aims to introduce the fundamental engineering principles involved in the processing of food products, with an emphasis on the quantification and analysis of process conditions, material and energy balances, heat transfer, and fluid flow.
Intended Learning Outcomes	Upon completion of the subject, students should be able to a) understand and apply the basic engineering principles and concepts in food processing; b) analyze, solve/calculate problems of material and energy balances, heat transfer in food processing; c) understand major characteristics of fluid flow and quantify the energy of fluid transportation in food processing; d) improve skills and capabilities in problem-solving and logical thinking.
Subject Synopsis/ Indicative Syllabus	<u>Engineering Terms and Measurements</u> Dimension and units; definition and measurement of process variables: temperature, pressure, flow rate and mixture composition; properties of materials: ideal gas law, multiple phase systems and equilibrium relationships. <u>Brief Introduction of Food Processing Technology</u> The composition and layout of common processes for food products; common separation processes (evaporation, crystallization, filtration, centrifugation, drying, absorption, distillation, liquid-liquid extraction, membrane processes). <u>Material and Energy Balances</u> Laws of mass and energy conservation; material balances for single- and multiple-unit systems as well as mixing and separation processes; energy

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<tr><td></td><td>terms, enthalpy changes and states of water, energy balances and heat exchange; simultaneous material and energy balances.

<u>Principles of Heat Transfer</u>
Basic means of heat transfer: conduction, convection and radiation; heat transfer in solids and fluids; heat transfer coefficients; common heat-transfer equipment (heat exchangers); heat transfer and energy balances in evaporation.

<u>Fluid Properties and Flow</u>
Basic characteristics of fluids: hydrostatic pressure, fluid viscosity and non-Newtonian fluid rheology, laminar and turbulent flow; fluid flow energy balances, friction losses; agitation and mixing; principles of common flow meters.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>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. 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>d</td><td></td><td></td></tr>
<tr><td>1. Final exam</td><td>50</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>2. Course work</td><td>50</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: Learning outcomes will be assessed continually through written assignments, quizzes and tests, and lab reports. The connection of these assessments to the learning outcomes will be stated explicitly to the students.
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Student Study Effort Expected	Class contact:	
	▪ Lectures	26 Hrs.
	▪ Tutorials	13 Hrs.
	Other student study effort:	
	▪ Self-study	52 Hrs.
	▪ Assignments	32 Hrs.
	Total student study effort	123 Hrs.
Reading List and References	Essential Smith, P.G., Introduction to Food Process Engineering, Springer 2002 Supplementary Wilhelm, L.R., Suter, D.A.and Brusewitz, G.H.; Food & Process Engineering Technology, American Society of Agricultural Engineers 2004 Geankoplis C J: Transport Processes and Separation Process Principles, Prentice Hall 2003-.	