Subject Description Form

Subject Code	**BSE2202**
Subject Title	**Air Conditioning II**
Credit Value	3
Level	2
Pre-requisite Co-requisite Exclusion	BSE2201 Air Conditioning I Nil Nil
Objectives	1. To provide knowledge of different refrigeration systems, heat exchangers, heat recovery systems and water distribution systems. 2. To provide a basic understanding of design criteria, installation, operation and control of AVC systems. 3. To introduce the acoustic and vibration control principles in relation to ACV systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) apply knowledge of thermodynamics, heat transfer and air-conditioning engineering to analyze, select and evaluate different refrigeration systems and heat recovery systems; b) identify, interpret and use appropriate codes, standards, regulations for the design of ACV systems considering both energy efficiency and environmental impacts; c) use theories and engineering calculations for design of water-side systems and equipment selection; d) apply knowledge of acoustics and vibration controls to explain and select appropriate acoustic and control installations for ACV systems; e) solve basic design, installation, operation and control problems of ACV systems; and f) prepare and interpret design schematics and diagrams of ACV systems.
Subject Synopsis/ Indicative Syllabus	**Refrigeration systems, components and control**: different types of refrigeration systems, vapour compression system, absorption refrigeration system, refrigerant and selection, types and characteristics of vapour compressors, compressors, clearance volume, volumetric efficiency, mechanical efficiency, evaporators and condensers, capacity control, refrigerant flow control and safety control. **Heat rejection systems and components**: air-cooled and water-cooled condensers, cooling towers and applications, sea water cooling, heat balance calculations. **Heat reclaim and heat pump systems**: building heat balance analysis, heat pump cycle, air-side and water-side heat recovery. **Water distribution systems, components and control:** pumping system design, single and two loop systems, constant and variable flow systems, sequence of multiple chillers, 2-way and 3-way control valves, pipe network flow analysis and balancing, selection of control valves, sensors, actuators, pumps selection and pipe sizing, and water-side schematic. **Acoustic and vibration control**: aural environment measurements, sound and noise, room acoustics, generation, transmission and control of noise from equipment, air system noise analysis, generation, transmission and control of vibration from equipment, characteristics and selection of isolation mountings.
Teaching/Learning Methodology	The subject is supported by an intensive tutorial scheme, which aims to ensure proficiency in standard calculations, and to develop the basic knowledge and skills for an air-conditioning and ventilation system design.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
Coursework*	60	✓	✓	✓	✓	✓	
Test	12	✓		✓	✓		
Group project and assignment	28	✓	✓	✓	✓	✓	✓
Total	100%						

* For details, please refer to the 2020/21 Semester 1 Subject teaching scheme/schedule.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The students will be briefed in the first lecture for the expected subject outcomes. The teaching and learning (T&L) methods adopt to achieve the expected outcomes include interactive lectures, supplemented by worked examples, tutorials, assignment and group project. Lecture notes, worked examples and tutorial problems are issued to students at the appropriate time to enhance learning.

Student Study Effort Expected

Class contact:	
▪ Lecture	20 Hrs.
▪ Tutorial	9 Hrs.
▪ Seminar	3 Hrs.
▪ Lab & fieldwork	6 Hrs.
▪ In-class test assessment	2 Hrs.
Other student study effort:	
▪ Self study	32 Hrs.
▪ Seminar preparation	6 Hrs.
▪ Lab report	12 Hrs.
▪ In-class assessment preparation	10 Hrs.
▪ Examination preparation	20 Hrs.
Total student study effort	120 Hrs.

Reading List and References

Miller, R. Air conditioning and refrigeration, New York: McGraw-Hill, 2006.

Jones W.P. Air conditioning engineering, 5th ed. Oxford: Butterworth-Heinemann, 2001.

McQuiston F.C., Parker J.D. and Spitler J.D. Heating, ventilating and air-conditioning analysis and design, 6th ed. New York: John Wiley & Sons, Inc., 2005.

Wang S.K. Handbook of air conditioning and refrigeration, 2nd ed. NY: McGraw-Hill, 2001.

Kreider J.F., Curtiss P.S. and Rabl A. Heating and cooling of buildings: Design for efficiency, CRC Press/Taylor & Francis, 2010.

Pita E.G. Air conditioning principles and systems, 4th ed. Prentice Hall, 2002.

Kinsler L.E. and Frey A.R. Fundamentals of Acoustics, John Wiley & Sons, 2000.

ASHRAE Handbook 2009 Fundamentals (Chapter 2; 7-8; 29-30). Atlanta: American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc., 2009.