SEE8129 Energy-efficient, Environmental-friendly Refrigeration and Air-conditioning

Course Title: Energy-efficient, Environmental-friendly Refrigeration and Air-conditioning
Course Code: SEE8129
Course Duration: One semester
Credit Units: 3
Level: R8
Medium of Instruction: English
Prerequisites: *(Course Code and Title)* None
Precursors: *(Course Code and Title)* None
Equivalent Courses: *(Course Code and Title)* None
Exclusive Courses: *(Course Code and Title)* None

Course Aims

This course aims to impart knowledge in advanced refrigeration and air-conditioning technologies for cooling, heating, thermal comfort and indoor air control in an energy-efficient, environmental-friendly manner. The course contents cover both theoretical sciences and applications to engineering design and control.

Course Intended Learning Outcomes (CILOs)

(state what the student is expected to be able to do at the end of the course according to a given standard of performance)

Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting (if applicable)
1.	Describe advanced refrigeration and air-conditioning principles	15%
2.	Design refrigeration and air-conditioning systems of high energy efficiency	35%
3.	Design refrigeration and air-conditioning systems of high environmental performance	20%
4.	Control refrigeration and air-conditioning system operation at high energy efficiency	30

Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	TLAs	Hours/week (if applicable)
CILO 1	Lectures/ interactive questioning and quiz/visits	
CILO 2	Lectures/ interactive questions and quiz	
CILO 3	Lectures/ interactive questions and quiz	
CILO 4	Lecturer/interactive questions and quiz	

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks

1,2,3,4	Quiz	20	
1,2,4	Assignments	10	
1,2,3,4	Examination	70	

Grading of Student Achievement: Refer to Grading of Courses in the Academic Regulations (Attachment) and to the Explanatory Notes.

Letter Grade	Grade Point	Grade Definitions	
A+ A A-	4.3 4.0 3.7	Excellent:	Strong capacity to analyse performance of advanced refrigeration and air-conditioning systems; strong ability to identify effective energy-efficient and environmental-friendly air-conditioning alternatives; evidence of extensive knowledge in refrigeration and air-conditioning.
B+ B B-	3.3 3.0 2.7	Good:	Evidence of ability to analyse performance of advanced refrigeration and air-conditioning systems; reasonable understanding of energy efficiency of advanced refrigeration and air-conditioning systems.
C+ C C-	2.3 2.0 1.7	Adequate:	Ability to analyse air-conditioning systems; understanding of refrigeration.
D	1.0	Marginal:	Ability to determine cooling/heating effects of refrigeration and air-conditioning systems.
F	0.0	Failure:	Little evidence of familiarity with the subject matter.

Keyword Syllabus

First and second laws of thermodynamics, vapour compression refrigeration cycle, multistage vapour compression, heat pump, thermal electric cooling, zero ozone depleting refrigerant, zero global warming potential refrigerant, computational modelling analysis, energy recovery, absorption refrigeration cycle, indoor air quality.

Recommended Reading

Text(s)

2011 ASHRAE Handbook—HVAC Applications (SI)
2010 ASHRAE Handbook—Refrigeration (SI)
2009 ASHRAE Handbook—Fundamentals (SI)
2008 ASHRAE Handbook—HVAC Systems and Equipment (SI)
Larry Jeffus, Refrigeration and Air-conditioning – An Introduction to HVAC/R, 4th Ed., 2003, Pearson Prentice Hall.

Academic Regulation 8 -- Grading of Courses

8.1 Courses are graded according to the following schedule:

Letter Grade	Grade Point	Grade Definitions	
A+ A A-	4.3 4.0 3.7	Excellent:	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.
B+ B B-	3.3 3.0 2.7	Good:	Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

C+ C C-	2.3 2.0 1.7	Adequate:	Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.
D	1.0	Marginal:	Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.
F	0.0	Failure:	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature.
P		Pass:	"Pass" in a pass-fail course. Courses to be graded on a pass-fail basis for a programme are specifically identified under the programme in the course catalogue.
<u>Operational Grades</u>			
IP	In Progress	An IP grade is shown where students will register in subsequent Semesters to complete the assessment of the course.	
I	Incomplete	A grade of incomplete may be granted (1) where there are extenuating circumstances that have prevented a student from completing required work, or attending the examination; (2) at the discretion of the Assessment Panel. Where an "I" grade is assigned, the Assessment Panel will approve a schedule for the completion of work, or a supplementary examination. An "I" grade will be converted into a "F" grade four weeks after the "I" grade is first reported to the Academic Regulations and Records Office, unless an alternative grade has been assigned.	
S	Dissertation Submitted	In a dissertation-type course, an S grade is assigned by the Course Examiner when a student's dissertation has been submitted for assessment.	
X		Assigned when a student is permitted to drop the course after the normal drop date.	

8.2 Students assigned a grade of D or better, or a Pass grade in a pass-fail course, earn credit units for the course. Grades of F, IP, I, S, or X do not earn credit units.

8.3 Grades of P, I, IP, S and X are not counted in the calculation of a student's CGPA. Grades of F are counted, unless the fail is recovered under AR11.3.

8.4 Grades of P, I, IP, S and X are not counted in the calculation of a student's SGPA.