MEC 4205 Air Conditioning and Refrigeration

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Brief Description of Course:

This course builds on Applied Thermodynamics Course. It gives a much more detailed study on air conditioning and refrigeration and expands on what was introduced in the earlier course.

Objectives of the Course:

The objectives of this course are:

- To introduce the principles and concepts of heating and cooling.
- To introduce the concept of refrigeration and air conditioning.

Expected Outcomes:

At the end of this course, a student should be able to:

- Perform heating and cooling load calculations
- Describe a refrigeration and air conditioning system
- Analyze a vapor compression and absorption system

Course Content:

Psychrometric Design **(4 Hours)**

- Properties of Humid Air
- Psychrometric Processes

Heating and Cooling Loads **(8 Hours)**

- Thermal Comfort
- Air Quality

- Thermal Transmission
- Infiltration and Ventilation Loads
- Components of the Cooling Load
- Internal Loads
- Solar Loads through Transparent Surfaces
- Solar Loads through Opaque Surfaces
- Cold-room design

Air-Conditioning Systems **(8 Hours)**

- Thermal Distribution Systems
- Classic Single-Zone Systems
- Multiple-Zone Systems
- Terminal-Reheat System
- Dual-Duct or Multizone System
- Variable-Air-Volume Systems

Fan and Duct Systems **(4 H_{ours})**

- Pressure drop in ducts and fittings
- Design of duct systems
- Centrifugal fans and their characteristics
- Fan laws

Refrigeration Plant **(9 hours)**

- The expansion valve
- Evaporators
- Compressors
- Condensers
- Refrigerants

Vapour Compression System Analysis **(4 Hours)**

- Balance points and System simulation
- Condenser Performance using both graphical and mathematical analysis
- Evaporator Performance using graphical and mathematical analysis

Absorption refrigeration **(4 Hours)**

- The Absorption Cycle
- The LiBr-Water Cycle
- Temperature, pressure, heat quantities and flow rates for the LiBr-Water cycle
- Coefficient of Performance
- Crystallization
- Capacity Control
- Aqua-Ammonia System

Noise Control **(2 Hours)**

- Acoustic Design in buildings

• Fan and air noise transmission in ducts

Maintenance and Commissioning

Commissioning Duct air-leakage test Airflow regulation Gas detectors

Ventilation rate measurement Maintenance schedule

Practicals **(45 Hours)**

Delivery Methods:

The course will be taught by using lectures and tutorials

Assessment Methods:

Course work (assignments and tests) and final examination and their relative contributions to final grade are shown as follows:

Requirement ***Percentage contribution***

Course work 40%

Final examination 60%

Total **100%**

References:

[1] B K Venkanna and B V Swati, 2011. Applied Thermodynamics. Phi Learning Pvt Ltd, ISBN: 978-81-203-4113-5

[2] Onkar Singh, 2009. Applied Thermodynamics 3/e. New Age International (P) Ltd, ISBN: 978-8122425833

[3] R.K. Rajput, 2009. Applied Thermodynamics. Laxmi Publications, ISBN: 9788131805831

[4] P K, Nag, 2002. Basic and Applied Thermodynamics. Tata McGraw-Hill, ISBN: 0070473382

[5] T.D. Eastop and A. Mcconkey, 1993. Applied Thermodynamics for Engineering Technologists. Longman Group UK Limited, ISBN: 978-0-582-09193-1