ME 287 January-April 3:0

Refrigeration Engineering

Instructor

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Teaching Assistant

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Department: Department of Mechanical Engineering, IISc, Bangalore-560012

Course Time: Usually Tuesdays and Thursdays, 1.5 hours on each day; Total number of contacts typically 25.

Lecture venue: Mini Class Room, Second Floor, Department of Mechanical Engineering

Detailed Course Page:

Announcements

Brief description of the course

Students interested in Refrigeration techniques and with some background in engineering thermodynamics, fluid mechanics and heat transfer can take the course. The course covers both the conventional and special-purpose refrigeration techniques.

Prerequisites

basics of engineering thermodynamics, fluid mechanics and heat transfer

Syllabus

Principles and methods of producing cold including thermoelectric, magnetic, vortex tube, thermoacoustic, pulse tube and other techniques. Absorption refrigeration including lithium bromide-water and aqua-ammonia systems and new working pairs. Thermal design of absorbers and generators. Vapour compression system and how a search to devise a practicable and efficient refrigeration system leads one from Carnot to Vapour Compression cycle. Multipressure cycles. Refrigerants: ozone depletion and Montreal Protocol, Various international treaties including Kyoto protocol, HFC and other new refrigerants, global warming problem, GWP and TEWI. Classification of compressors. Theory and working of compressors (reciprocating, rotary,

vane, double-screw, mono-screw, scroll, Wankel, etc.). Expansion valves (capillary tube, automatic, high and low side floats, thermostatic and electronic, limit charged valves). Condensers (shell-and-tube, finned air-cooled, etc.). Evaporators (of various types) and two-phase flow patterns in evaporators. The complete vapour compression cycle simulation. All the topics are given a thorough coverage typical of a Masters level course, i.e. the coverage is at an advanced level rather than elementary.

Course outcomes

Refrigeration field is the most important applied energy and a major energy consuming sector. The students will come to know both the older technologies and the newer developments in the face of ozone depletion and global warming problems.

Grading policy

Typically 75% for examinations and 25% for assignments.

Assignments

Problems on various topics ad computer assignments on the design of capillary tube expansion valve, water and air-cooled condensers, etc.

Resources

I have prepared handouts for various topics at a level suitable for Masters degree and Ph. D. students. Apart from this, the students are encouraged to read well-known books authored by Stoecker and Jones, Threlkeld, Gosney, etc.