



### Course Handout (Part II)

In addition to Part-I (general handout for all courses in the time-table), this handout provides specific details regarding the course.

**Course No.:** ME F214 / MF F214  
**Course Title:** Applied Thermodynamics  
**Instructor-in-charge:** Ravi Inder Singh and Souvik Bhattacharyya  
**Instructors(Tut):** Ravi Inder Singh, Manoj Soni, Sachin U Belgamwar and Sandeep Dhar.

**Scope and Objective:** The subject matter in this course covers the applications of thermodynamics. This course is designed to acquaint the students with the thermodynamics of power generating and power absorbing machines. The course discusses gas and vapour power cycles, boilers and accessories, combined cycle power generation, Air and gas compressors, vapour compression and absorption refrigeration cycles, gas mixtures, psychrometry and air-conditioning.

#### Text Books:

1. Çengel Y.A. and Boles M.A., *Thermodynamics* (SI Units); 8th Ed., 2015; Mcgraw Hill Education.
2. NPTEL Notes: *Refrigeration and Air Conditioning*,  
[http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/New\\_index1.html](http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/New_index1.html).

#### Reference Books:

1. Nag P.K, *Engineering Thermodynamics*, 4th Ed., 2008, Mcgraw Hill Education.
2. Arora RC, *Refrigeration & Air conditioning*, 1st Ed., 2010, Prentice Hall India.
3. Arora CP, *Refrigeration and Air Conditioning*; 3rd Ed., 2009; McGraw-Hill Education.





**Course Plan:**

Module #	Learning objectives	Topics	Chapter No. of TB / RB	# of Ls
1	Introduction: Power and Refrigeration cycles	Recap: thermodynamics basics. Vapour power cycles. Gas turbine cycles. Internal Combustion Engines. Refrigeration cycle.	Class Notes; 2, 4 & 6 RB1	2
2	Entropy & Exergy balance	Entropy balance of open and close systems. Exergy balance of open and close systems. Second Law Efficiency.	7 & 8, TB1	2
3	Vapor power cycles	Carnot cycle deficiencies, Simple vapour power cycle, Ranking Cycle, Actual vapour power cycle, Mean temperature of heat addition. Techniques for efficiency improvement, Reheat and Regenerative cycles with open & closed feed water heaters. Combined cycle power plant and its thermodynamics. Combined Heat and Power.	10, TB1	5
4	Boilers and Accessories	Introduction, types of boilers, requirements of a good boiler, High pressure boilers, Boiler mountings and accessories.	Class Notes	4
5	Gas power cycles	Carnot Cycle, Stirling cycle, Ericsson Cycle, Air Standard Cycles, Otto Cycle, Diesel Cycle, Dual Cycle. Brayton cycle: intercooling, reheating and regeneration. Gas Turbine power plants.	9, TB1	6
6	Refrigeration Cycle	Vapor Compression Refrigeration Cycle, Actual Vapor Compression Cycle, Heat Pump, Second Law Efficiency of Vapor Compression Cycle.	11, TB1	3
7	Air and Gas Compressors	General Introduction, The reciprocating air compressor, Effect of clearance volume, Multistage Reciprocating Compressor, Rotary Air compressors, Total or Stagnation temperature and pressure.	18, RB1	4





8	Vapour Absorption Systems	Basic principle of a Simple Vapour-Absorption System, Comparison of vapour compression refrigeration systems with continuous vapour absorption refrigeration systems, maximum COP of an ideal absorption refrigeration system, properties of ideal and real refrigerant-absorbent mixtures, single stage vapour absorption refrigeration system with solution heat exchanger.	15, TB2; RB2 & RB3	4
9	Properties of moist air	Psychrometric Properties, Psychrometric Chart, Mixing of moist air, Psychrometry of air conditioning processes.	13 & 14, TB1; TB2, RB2 & RB3	3
10	Psychrometry of air-conditioning systems	Inside and Outside Design Conditions, Simple Summer Air Conditioning System, Supply Air condition and flow rate, Apparatus Dew Point, Winter Air Conditioning.	13 & 14, TB1; 30, TB2 RB2 & RB3	4
11	Closure	Review		1





**Evaluation Scheme:**

Components	Duration	Weight age (%)	Maximum Marks [200]	No.	Date & Time	Remarks
Tutorial Tests	20-50 min.	20	40 = 2*20	4	Surprise	Open Book
Mid Semester Test	90 min.	30	60	1	07.10.16	Close book
Technical Quiz	50 min	10	20 = 2*10	2	14.9 & 22.11	Close/Open Book
Comprehensive Test	180 min	40	80	1	10.12.16(FN)	Close Book

**Mid-semester grading:** The will be held on 07.10.16 October. It is done in the same manner as that of the final grading.

**Tutorials Tests:** Best two will be taken out of 4 - two before mid semester test and two will be after mid semester tests. During tutorial tests, thermodynamics tables and Psychometric charts are permitted.

**Technical Quiz:** Time and Venue will be informed in Class or Will be Posted on Nalanda.

**Chamber Consultation Hours (Instructor Incharge):** Room No.: 2230. Time: 3.00-4.00 PM

**Notices:** All notices related to this course will be put on the Mech. Engineering notice board only.

**Make-up Policy:** Make-up will be given only to the genuine students. The request application for make-up test must reach the Instructor-in-charge before commencement of the scheduled test (documentary proof is essential). No make-up will be allowed for the tutorial tests.

***Instructor-in-charge and Co Instructor***  
***Ravi Inder Singh and Souvik Bhattacharyya***  
***MEF214/MFF214***

