BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI - HYDERABAD CAMPUS
INSTRUCTION DIVISION, FIRST SEMESTER 2015 - 2016
(COURSE HANDOUT PART II)

Date: 09/05/2016

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

Course No.: ME F214 / MF F214

Course Title: APPLIED THERMODYNAMICS

Instructor-in-charge: Dr. Supradeepan K

Instructor(s): Dr. Supradeepan K

1. **Scope and Objective:** This course is designed to acquaint the students with the thermodynamics of power developing and power absorbing machines. The course discusses about gas and vapour cycles, combined power generation cycles, refrigeration cycles, psychrometry and basic air conditioning concepts, gas turbine cycles. It also focuses on thermodynamic relations, gas mixtures, exergy and gas dynamics fundamentals.

2. **Course Description**: Availability and irreversibility, Thermodynamic relations, Compressible flow, Ideal gas and vapour cycles, Combined power generation cycles, gas mixtures, Refrigeration cycles, Psychrometrics and introduction to heat load calculations, Gas turbine cycles, Compressors, Boilers and accessories.

3. **Text Book**:

   P.K. Nag, "*Engineering Thermodynamics*" – Tata McGraw-Hill Publishing Company Ltd., 4th Ed., 2008.

   Reference Books:

   1. **T. D. Eastop & A. McConkey**, "*Applied Thermodynamics*" – Pearson Education, 5th Ed., 2008.
   2. **Rayner J.**, "*Basic Engineering Thermodynamics*" – Pearson Education, 5th Ed., 2008.
   3. **Claus Borgnakke & Richard E. Sonntag**, "*Fundamentals of Thermodynamics*", John Wiley & Sons, 7th Ed., 2009.

4. Course Plan:

Lecture Nos.	Learning Objectives	Topics to be covered	Chapter
1-7	Vapour Power Cycles	Rankine cycle, Actual vapour cycle and comparison with Carnot cycle, Mean temperature of heat addition, Reheat cycle, Regenerative cycle, Feed water heaters, Exergy analysis, Binary vapour cycles, Process heat and by-product power, Efficiencies in steam power plant	12
8-15	Gas Power Cycles & Propulsion	Stirling, Ericsson, Otto, Diesel, Dual cycle, Comparison, Brayton cycle, Combined cycles and Aircraft propulsion	13
16-19	Gas Compressors	Single-stage and Multi-Stage Compression, Volumetric efficiency, Rotary compressor	18
20-25	Refrigeration Cycles	Reversed Heat Engine Cycle, Vapor Compression Cycle, Absorption Cycle, Heat pump system, Gas cycle refrigeration, Liquefaction of gases	14
26-30	Psychrometrics	Properties of air, Psychrometry chart, Psychrometric processes	15
31-32	Thermodynamic Relations & Gas mixtures	Maxwell's equations, Energy equation, Joule-Kelvin effect, Clausius-Clapeyron equation, Dalton's law of partial pressures	11.1 – 11.8 & 10.8
33-35	Compressible Fluid Flow	Stagnation properties, 1-D steady isentropic flow, Normal shocks, Adiabatic flow with friction, Diabatic flow without friction	17
36	Boilers and Accessories	Boiler classification, Functions, Nomenclature, Mountings and accessories, Circulation	Class notes
37-40	Availability & Irreversibility	Maximum work in a reversible process, Dead state, Availability and its balance, Second law efficiency	8

5. Evaluation Scheme:

Evaluation Component	Duration	Weightage (%)	Date & Time	Nature of Component
Test-1	60 min	20		CB
Test-2	60 min	20		CB
Assignments		20		OB
Comprehensive Exam	180 min	40		CB

NOTE: (i) EDD Notes on Thermodynamics Tables, Figures and Charts and (ii) Psychromeric Chart are allowed in the closed book tests also. However, they should not be defaced by writing formula, equations, etc.

6. Chamber Consultation Hour: To be announced in the class room.

7. *Surprise tutorial tests of 10 minutes duration each will be conducted during the tutorials or regular classes and these will be evaluated for ten marks each.

8. Notices: All notices concerning this course will be displayed only on the CMS or Mechanical Engineering Department Notice Board. Besides this, students are advised to visit regularly **CMS** (institute's web based course management system) for latest updates.

9. Make-up Policy: Make-up shall be given only to the genuine cases with prior intimation. No make-up will be given for the surprise tests. Surprise tests shall be conducted in either *lecture class* or *tutorial class*.

Dr. Supradeepan K
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