



FIRST SEMESTER 2019 - 2020

(COURSE HANDOUT PART II)

Date: 01/08/2019

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

Course No.: ME F214 / MF F214

Course Title: APPLIED THERMODYNAMICS

Instructor-in-charge: SATISH KUMAR DUBEY

Instructor(s): R Naresh , Sama.Sanghamitra, A. Uday Kumar.

1. 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.

2. 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.

3. Text Book:

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

Reference Books:

- T. D. Eastop & A. McConkey**, "*Applied Thermodynamics*" – Pearson Education, 5th Ed., 2008.
- Rayner J.**, "*Basic Engineering Thermodynamics*" – Pearson Education, 5th Ed., 2008.
- 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 in the Text Book
1-4	Availability & Irreversibility	Maximum work in a reversible process, Dead state, Availability and its balance, Second law efficiency	8
5-11	Vapour Power Cycles	Rankine cycle, Actual vapour cycle and comparison with Carnot cycle, Mean temperature of heat addition,	12

Lecture Nos.	Learning Objectives	Topics to be covered	Chapter in the Text Book
		Reheat cycle, Regenerative cycle, Feed water heaters, Exergy analysis, Binary vapour cycles, Process heat and by-product power, Efficiencies in steam power plant	
12-18	Gas Power Cycles & Propulsion	Stirling, Ericsson, Otto, Diesel, Dual cycle, Comparison, Brayton cycle, Combined cycles and Aircraft propulsion	13
19-22	Gas Compressors	Single-stage and Multi-Stage Compression, Volumetric efficiency. Rotary compressor	18
23-28	Refrigeration Cycles	Reversed Heat Engine Cycle, Vapor Compression Cycle, Absorption Cycle, Heat pump system, Gas cycle refrigeration, Liquefaction of gases	14
29-33	Psychrometrics	Properties of air, Psychrometry chart, Psychrometric processes	15
34-38	Compressible Fluid Flow	Stagnation properties, 1-D steady isentropic flow, Normal shocks, Adiabatic flow with friction, Diabatic flow without friction	17
39-40	Boilers and Accessories	Boiler classification, Functions, Nomenclature, Mountings and accessories, Circulation	Class notes
41-42	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

5. Evaluation Scheme:

Evaluation Component	Duration (minute)	Weightage (%)	Date & Time	Nature of Component
Tutorial Test [#]	–	20	During Tutorial hours	OB
Quiz [#]	-	10	During lecture hours	CB
Mid Semester Test [#]	90	25	13/12 FN	CB
Comprehensive Exam [#]	180	45	5/10, 9.00 -- 10.30 AM	CB

NOTE:

EDD Notes on Thermodynamics Tables and Psychrometric Chart are allowed to use during the tests. However, they should not be defaced by writing formula, equations, etc.

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

7. Notices: All notices concerning this course shall be displayed on the Mechanical Engineering Notice Board. Students are advised also to visit regularly **CMS** (institute's web based course management system) for updates on the course matters.

8. 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*.

9. **Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
ME F214 / MF F214