Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2024 - 2025
(COURSE HANDOUT PART II)

Date: 01/08/2024

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

Course No.: MEF217

Course Title: APPLIED THERMODYNAMICS

Instructor-in-charge: SATISH KUMAR DUBEY

Lecture Instructors: Satish Kumar Dubey, Jayaprakash K S

Tutorial Instructor(s): Satish K Dubey, Jayaprakash K S, S S Deshmukh, Mrinal K Jagirdar, Shaik Gouse Ahammad, Kiran Somisetti

Practical Instructor(s): Satish K Dubey, Shaik Gouse Ahammad, Dhoni Nagaraju, Sanjeet Kumar, Meduri Sita Ram, Suhas Sreekrishna, Joshua Kumar Saladi, Sibin V Mathew, Lingampally Swetha, Kalyani Panigrahi

1. Course Description: Thermodynamics relations, gas and vapour cycles, combined power generation cycles, gas mixtures, refrigeration cycles, psychometrics and heat load calculations, gas turbine cycles, compressors, boilers, and accessories; Experiments related to applied thermodynamics and fluid mechanics courses.

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

3. Text Book:

Yunus A. Cengel, Michael A. Boles, Mehmet Kanoglu, Thermodynamics – An Engineering Approach, 9th Edition, McGrawhill India, 2019

Reference Books:

1. **P.K. Nag, "Engineering Thermodynamics" – Tata McGraw-Hill Publishing Company Ltd., 4th Ed., 2008**
2. **T. D. Eastop & A. McConkey**, "*Applied 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	Over view of Course Reviewing of basic concepts	Introduction to course Overview Importance of thermodynamics and its applications, review of first and second law concepts, heat engines and refrigeration systems	Excerpts from 1-8
2-12	Vapour Power Cycles	Carnot vapor and Ideal Rankine cycle, Actual vapor cycle, Reheat, Regenerative Rankine cycles, Co-generation, combined gas-vapor power cycles	10
13-15	Boilers and Accessories	Boiler classification, Functions, Nomenclature, Mountings and accessories, Circulation	Class notes
16-18	Positive Displacement Gas	Single-stage and Multi-Stage reciprocating Compression,	Class notes

Lecture Nos.	Learning Objectives	Topics to be covered	Chapter
	Compressors	Volumetric efficiency. Rotary compressor	and Chapter 18of RB1
19-26	Gas Power Cycles & Propulsion	Stirling, Ericsson, Otto, Diesel, Dual cycle, Comparison, Brayton cycle, Intercooling Reheat cycle, Regenerative cycle, Combined cycles and Aircraft propulsion	09
27-31	Refrigeration Cycles	Reversed Heat Engine Cycle, Vapor Compression Cycle, Absorption Cycle, Heat pump system, Gas cycle refrigeration, Liquefaction of gases	11
32-39	Psychrometrics air conditioning processes	Properties of air, Psychrometry chart, Psychrometric processes, Human comfort and air conditioning, air conditioning processes and systems	14 and Class notes
40-42	Thermodynamic Relations & Gas mixtures	Maxwell relations, the Claypeyron equation, relations for changes in IE, enthalpy, entropy, specific heat relations, Joule-Thomson coefficient, relations for real gases	12

List of Experiments: (Provisional, may change based on Equipment Status)

1) Calibrating the venturi meter and orifice meter
2) Estimating the frictional loss in a pipe flow
3) Estimating the losses due to various pipe fittings
4) Estimating the force exerted when a jet impinging a flat and curved plates
5) Verification of Bernoulli's theorem
6) Study and Performance test on Vapour Compression Refrigeration System
7) Study and Performance test on Ice Plant Test Rig
8) Study and Performance test on Vapour Absorption Referigeration System
9) Study and Performance test on Heat Pump Test Rig
10) Study and Performance test on Window A/C Test Rig
11) Study and Performance test on Steam Power Plant
12) Study and Performance test on Reciprocating Compressor Test Rig

4. **Evaluation Scheme**:

Evaluation Component	Duration (minute)	Weightage (%)	Marks	Date & Time	Nature of Component
Mid Semester Test	90	20	60	09/10 - 9.30 - 11.00AM	CB
Tutorial Test(s)	25	15	45	Evenly spaced throughout the semester during tutorial hour	OB
Lecture Quiz(s)	10	10	30	Evenly spaced throughout the semester during Lecture hour (Surprise in nature)	OB
Lab work *	-	20	60	Evenly spaced throughout the semester during practical class hours	OB
Comprehensive Exam	180	35	105	16/12 FN	CB

***Lab work**

Evaluation Component	Duration (minute)	Weightage (%)	Date & Time	Nature of Component
Lab Reports	-	10%	Continuous During Practical hour	OB
Lab Viva	-	10 %	Continuous During Practical hour	-

NOTE:

6. **Chamber Consultation Hour**: To be announced in the class room.
7. **Notices**: All notices concerning this course shall be displayed on the CMS Students are advised 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 TUTORIAL tests and Lecture Quiz(s)
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 F217