

FIRST SEMESTER 2021 - 2022

(COURSE HANDOUT PART II)

Date: 20/08/2021

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

**Tutorial Instructor(s)**: B Sravya, R Naresh , Shaik Gouse Ahammad ,Sunkara Prudhvi Raj, Mrinal Ketan Jagirdar, Satish K Dubey

**Practical Instructor(s)**: B Sravya, J Murali Mohan, P Ankamma Rao, Sunkara Prudhvi Raj, V Venkateswara Rao, Shaik Gouse Ahammad , Deepak Nabapure, G Venkata Naga Trivedi, R Naresh, Kalyani Panigrahi, M Srinivas,

**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**:

**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 in the Text Book** |
| --- | --- | --- | --- |
| 1 | Over view of Course | Introduction to course Overview |  |
| 2-13 | 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 |
| 14-16 | Boilers and Accessories | Boiler classification, Functions, Nomenclature, Mountings and accessories, Circulation | Class notes |
| 17-20 | Gas Compressors | Single-stage and Multi-Stage Compression, Volumetric efficiency. Rotary compressor | 18 |
| 21-28 | Gas Power Cycles & Propulsion | Stirling, Ericsson, Otto, Diesel, Dual cycle, Comparison, Brayton cycle, Intercooling Reheat cycle, Regenerative cycle, Combined cycles and Aircraft propulsion | 13 |
| 29-33 | Refrigeration Cycles | Reversed Heat Engine Cycle, Vapor Compression Cycle, Absorption Cycle, Heat pump system, Gas cycle refrigeration, Liquefaction of gases | 14 |
| 34-40 | Psychrometrics | Properties of air, Psychrometry chart, Psychrometric processes | 15 |
| 41-43 | 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 |

**List of Experiments:**

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 imping 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
13. **Evaluation Scheme**:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Evaluation Component | **Duration**  **(minute)** | **Weightage (%)** | **Marks** | **Date & Time** | **Nature of Component** |
| Mid Semester Test | 90 | 30 | 90 | 20/10/2021 9.00 - 10.30AM | **OB** |
| Tutorial Test(s) | - | 10 | 30 | Evenly spaced throughout the semester during tutorial hour | **OB** |
| Lab work \* | - | 20 | 60 | Evenly spaced throughout the semester during Practical | **OB** |
| Comprehensive Exam | 120 | 40 | 120 | 16/12 FN | OB |

\***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 | OB |

**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.

**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**