BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI - HYDERABAD CAMPUS FIRST SEMESTER 2023 - 2024 (COURSE HANDOUT PART II)

Date: 11/08/2023

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 F317

**Course Title**: Engines, Motors and Mobility

**Instructor-in-charge**: N JALAIAH

**Instructor(s)**: N Jalaiah, K Monika, M Sitaram, Joshua Kumar Saladi, Kalyani Panigrahi, Mrinal Ketan Jagirdar

1. **Course Description**: Introduction – injection & ignition systems, lubrication and cooling, measurement and testing, emissions and control; fuel-air cycles; actual cycles; conventional fuels; combustion; alternate fuels; modern mobility solutions; electric and hybrid vehicles; comparison of conventional vehicles with electric vehicles in terms of advantages, disadvantages, and applications.
2. **Scope and Objective:** This course is designed to make the students familiar with the working principles of an internal combustion engines. It deals with the principle of operations, fuels, combustion and performance of an internal combustion engines; along with working analysis and design of various systems. It also presents the current trends in hybrid and electric vehicles.

# Text Book:

* 1. Ganesan, Internal Combustion Engines, Tata McGraw-Hill, 4th Edition, 2012

# Reference Books:

* + 1. M. L. Mathur and R. P. Sharma, A course in Internal Combustion Engines, Dhanpath Rai and Sons.
    2. R. Rogowski, Elements of I. C. Engines, Tata McGraw-Hill.

# Course Plan:

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture Nos.** | **Learning Objectives** | **Topics to be covered** | **Chapter** |
| 1-5 | Introduction to IC Engines, Air standard cycles and their analysis, Fuel-air cycles and their analysis | Working principle, classification and performance parameters of an IC Engines, Auto, Diesel and Dual cycle, Variable specific heats, Dissociation, Comparison of air standard and fuel  air cycle | 1, 2 & 3 |
| 6-7 | Actual cycle and their analysis | Valve-timing diagram, Time loss factor, Heat loss factor, Exhaust blow down | 4 |
| 8 | Conventional and Alternative Fuels | Conventional fuel, Liquid fuels, Possible alternative fuels | 5 & 6 |
| 9-10 | Carburetion | Carburetion, Engine mixture requirements, Simple carburetor, Calculation of air fuel ratio | 7 |
| 11-12 | Mechanical and Electronic injection system | Classification, Fuel feed Pump, Injector, Nozzle, MPFI and ECU | 8 & 9 |
| 13-14 | Ignition | Battery ignition system, Magneto ignition system, Modern ignition systems | 10 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture Nos.** | **Learning Objectives** | **Topics to be covered** | **Chapter** |
| 15-16 | Engine friction and lubrication | Mechanical friction. Lubrication, Properties of lubricant | 12 |
| 17-18 | Heat rejection and cooling | Temperature distribution, Liquid and Air cooling system | 13 |
| 19 | Engine Emissions and their control | Hydrocarbon and other emissions, Converter | 14 |
| 20-22 | Measurement and Testing, Performance parameters and  characteristics | Measurement of IP, BP, etc, Efficiency and heat balance sheet | 15 & 16 |
| 23 | Supercharging | Supercharger, Supercharging methods | 18 |
| 24-28 | Electric and hybrid vehicles | Engine electronics, Electric and hybrid vehicles and their comparison | 17 & Class notes |

1. **Evaluation Scheme**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Evaluation Component** | **Duration (min)** | **Weightage (%)** | **Date & Time** | **Nature of the Component** |
| Tutorial Test | --- | 30 | Tutorial Class (Best 8 out of 10) | **OB** |
| Mid-Sem Test | 90 | 30 | 10/10 - 2.00 - 3.30PM | **CB** |
| Comprehensive Exam | 180 | 40 | 11/12 FN | **CB** |

1. **Chamber Consultation Hour**: To be announced in the classroom.
2. **Notices**: Students are advised to visit regularly **CMS** (institute’s web based course management system) for updates and notices.
3. **Make-up Policy**: Make-up shall be given only to the genuine cases with prior intimation.
4. **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 F317**