

Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

SYLLABUS FOR BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (Effective from academic session 2018-19)

Subject Code: A	Category: Professional Elective Courses
Subject Name: Internal Combustion Engines and Gas Turbines	Semester: Sixth
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: Thermodynamics, Heat Transfer	

Course Objectives:

To acquire knowledge about the IC engine cycles, classification, working Principles and to measure performance parameters along with heat balance sheet.

To explain different alternate fuels, gas turbines and about jet propulsion

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	<p>Introduction: Basic Engine components and Nomenclature, Classification of Engines, The working principle of Engines, Comparison of 2-Stroke and 4-Stroke Engines; CI, and SI Engines, Ideal and Actual Working Cycles and their analysis, Valve timing Diagram. Fuels: Fossil fuels, Chemical structure of Petroleum, Properties of SI and CI Engine Fuels, Fuel Ratings; Octane Number, Cetane Number.</p>	6
2	<p>Carburetors & Fuel Injection: Air Fuel Mixture Requirements, Construction and Working of Simple Carburetor, Calculation of Air-Fuel Ratio, Parts of Carburetor. Requirement of Injection Systems, Classification of Injection Systems, Fuel Feed pump, Injection Pumps, Working principles of Governors, Nozzles and Fuel Injector, Injection in SI and CI Engines. Combustion and Ignition Systems in SI and CI Engines: Normal and Abnormal Combustion in SI and CI Engines, Stages of Combustion, Detonation and Knocking.</p>	7
3	<p>Performance parameters for IC Engines: Engine Power, Engine Efficiencies, Performance Characteristics, Variables Effecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance. Modern Automotive Engines: Changes in Fuel injection Methods in S.I and C.I engines, Common Rail Direct Injection System, Gasoline Direct Injection, Variable Valve Technology, A brief review of Design changes to achieve high efficiency.</p>	7
5	Alternate Fuels For IC Engines: Need for use of alternate fuels. Use of alcohol fuels. Biodiesel.	3

	Biogas and Hydrogen in engines.	
6	Gas Turbine: Introduction to Gas Turbines, Development, Classification and Application of Gas Turbines, Ideal and Actual Cycles; Effect of Intercooling, Reheating, Regeneration, Combined cycle and Cogeneration.	6
7	Gas Turbine Cycles for Aircraft Propulsion: Criteria of performance, Intake, and propelling nozzle efficiencies, Simple Turbojet Cycle, The turboprop engine, Thrust augmentation, Gas turbine combustion systems, Combustion chamber designs, Gas Turbine Emissions.	7

Course Outcomes:

1. Explained basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles.
2. Described the combustion phenomenon in SI and CI engines.
3. Evaluated the performance of IC engines and the importance of alternate fuels.
4. Classified the essential components of gas turbine along with its performance improving methods.
5. Illustrated the working principle of different types of Jet propulsive engines and Rockets.

Learning Resources:

1. V. Ganesan, I.C. Engines, McGraw Hill, 2017.
2. V. Ganesan, Gas Turbines, McGraw Hill, 2004.
3. C.R. Ferguson and A.T. Kirkpatrick, Internal Combustion Engines, Wiley, 2015.
4. H.N. Gupta, Fundamentals of Internal Combustion Engines, PHI, 2012.
5. H. Cohen, H.I.H. Saravanamuttoo, G.F.C. Rogers, P. Straznicky and A.C. Nix, Gas Turbine Theory, Pearson, 2019.
6. J.B. Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Co., 1988.
7. W.W. Pulkrabek, Engineering Fundamentals of IC Engine, PHI Pvt. Ltd., 2002.