



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF MECHANICAL ENGINEERING

III Year - I Semester		L	T	P	C
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IC ENGINES & GAS TURBINES					

Learning Objectives:

- (1) To make the student learn and understand the reasons and affects of various losses that occur in the actual engine operation.
- (2) To familiarize the student with the various engine systems along with their function and necessity.
- (3) To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.
- (4) To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.

UNIT – I

Air standard Cycles: otto, diesel and dual cycles, its comparison, Brayton cycle

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT – II

I. C. ENGINES : Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems – Fuel, Carburettor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine, principles of supercharging and turbo charging.

UNIT – III

Combustion in S.I. Engines : Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

Combustion in C.I. Engines : Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT – IV

Measurement, Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT – V

GAS TURBINES: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed cycle type gas turbines.

JET PROPULSION : Principle of operation –classification of jet propulsive engines – working principles with schematic diagrams and representation on t-s diagram - thrust, thrust power and propulsion efficiency – turbo jet engines – needs and demands met by turbo jet – schematic diagram, thermodynamic cycle, performance evaluation (Definitions and Simple Problems).

ROCKETS: Application – working principle – classification – propellant type – thrust, propulsive efficiency – specific impulse – solid and liquid propellant rocket engines (only Theoretical concepts).



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Text Books:

1. I.C. Engines - V. Ganesan- Tata McGraw Hill Publishers
2. Gas Turbines – V.Ganesan – Tata McGraw Hill Publishers

References:

1. Thermal Engineering - Mahesh Rathore- McGraw Hill publishers
2. I.C.Engines–AppliedThermosciences–C.R.Ferguson&A.T.Kirkpatrick-2ndEdition-Wiley Publ
3. I.C. Engines - J.B.Heywood /McGrawHill.
4. Heat engines, Vasandani & Kumar - Thermal publications
5. Gas Turbine Theory – HIH Saravanamuttoo, Cohen, Rogers –Pearson Publishers

Course Outcomes: Student must able to,

- CO1: Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications.
CO2: Explain working principle and various components of IC engine
CO3: Explain combustion phenomenon of CI and SI engines and their impact on engine variables.
CO4: Analyze the performance of an IC engine based on the performance parameters.
CO5: Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine.
CO6: Explain the applications and working principle of rockets and jet propulsion.