B.Tech. (Fifth Semester) Mechanical Engineering

ME- 301E I.C. Engine and Gas Turbines

L	T	P/D	Total	
3	1	-	4	

Theory : 100 marks
Sessional : 50 marks
Duration of Exams. : 03 hours

Unit1.

Heat engines; internal and external combustion engines; Classification of I.C. Engines, Cycle of operations in four strokes and two stroke I.C. engines. Wankel engine. Assumptions made in air standard cycles; Otto cycle; Diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; Deviation of actual engine cycle from ideal cycle.

Unit 2.

Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, calculation of fuel air ratio; the complete carburetor. Requirements of a diesel injection system; types of injection systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs.S.I engines: ignition limits; stages of combustion in S.I. Engines; ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; Octane rating of fuels; pre-ignition; S.I. engine combustion chambers. Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. Engines; Cetane rating; C.I. Engine combustion chambers.

Unit 3.

Functions of a lubricating system, Types of lubrication system: mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants; engine performance and lubrication. Necessity of engine cooling; disadvantages of overcooling; cooling systems: air-cooling, water-cooling; radiators.Performance parameters: BHP, IHP, mechanical efficiency; brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC); thermal efficiency; heat balance; Basic engine measurements: fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves.

Unit4.

Pollutants from S.I. and C.I. Engines; methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front. Working of a single stage reciprocating air compressor; calculation of work input; Volumetric efficiency; Isothermal efficiency; Advantages of multi stage compression; Two stage compressor with inter-cooling; perfect inter cooling; Optimum intercooler pressure; Rotary air compressors and their applications; Isentropic efficiency.Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle: multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger. Applications of gas turbines.

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 303E Fluid Machines

L	T	P/D	Total	
3	1	-	4	

Theory: 100marks
Sessional: 50 marks
Duration of Exams. : 03 hours

Unit1:

Impact of jet on stationary and moving flat and curved plates, force on series of vanes Radial vanes, vortex motion, free and forced vortex, jet propulsion of ships. Units and dimensions, dimensional homogeneity, dimensional analysis method: Raleigh and Buckingham methods, application and limitation of dimensional analysis, dimensionless numbers, similitude laws

Unit2:

Introduction, development of hydraulic turbines, components of hydro-power plant, classification of turbines, Euler's equation and degree of reaction, losses and efficiency of turbines, surge tank and its type. Elton turbine, its components, number and dimension of buckets, speed rotation, jet ratio, energy conversion, condition for maximum efficiency, design considerations, governing etc.Francis turbine: components, working principles, draft tube, types of draft tube, design considerations,, outward vs. inward flow reaction turbines, introduction to Deriaz turbine, evolution of axial flow turbines, Kaplan turbine, operation at off design loads, governing etc.Unit quantities, specific speed, runway speed, characteristics of turbines,

Unit3.

Introduction, classification, components, principle of working, various heads, energy conversion, Euler's head and its variation with vane shapes, effect of finite number of vanes, losses and efficiencies, minimum starting speed, limitation of suction lift, Net Positive Suction Head (NPSH), multistage pumps, specific speed and performanceWorking principles, classification, components, discharge, slip, power input, indicator diagram, effect of friction

acceleration and pipe friction, maximum speed, air vessels, comparison with centrifugal pumps, Model testing of pumps

Unit4.

Cavitations and its effects, Cavitation parameters, Detection and prevention of cavitations, Model testing of turbines, Propeller pump, Jet pump, Airlift pump, Gear pump, Screw pump, Vane pump, Radial piston pump, Submersible pump, pump problems Hydraulic accumulators, hydraulic intensifier, hydraulic lift, hydraulic crane, hydraulic coupling, torque converter, hydraulic ram.

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 305E Heat Transfer

L	T	P/D	Total		
3	1	-	4	**Theory**	**: 100 marks**
				Sessional	**: 50 marks**
				Duration of Exams.	**: 03 hours**

Unit1:

Definition of heat; Modes of Heat Transfer; Basic Laws of heat transfer; Electrical Analogy of heat conduction; Conduction through composite walls; Overall heat transfer coefficient. The General Conduction equation in Cartesian, cylindrical and spherical coordinates; steady one dimensional heat conduction without internal heat generation: the plane slab; the cylindrical shell; the spherical shell; Critical thickness of insulation; Variable thermal conductivity, Steady one dimensional heat conduction with uniform internal heat generation: the plane slab; cylindrical and spherical systems. Fins of uniform cross-section: Governing equation; Temperature distribution and heat dissipation rate; Efficiency and effectiveness of fins.

Unit2:

Free and forced convection; Newton's law of cooling; convective heat transfer Coefficient; Nusselt number; Dimensional analysis of free and forced convection; Analytical solution to forced convection problems: the concept of boundary layer; hydrodynamic and thermal boundary layer; Momentum and Energy equations for boundary layer. Exact solution for laminar flow over an isothermal plate using similarity transformation. The integral approach; integral momentum and energy equations; solution of forced convection over a flat plate using the integral method. Analysis of free convection; governing equations for velocity and temperature fields. Relation between fluid friction and heat transfer, Reynolds analogy. Dimensionless numbers: Reynolds, Prandtl, Nusselt, Grashoff and Stanton Numbers and their significance, Heat transfer with change of phase; Nusselt theory of laminar film Condensation.

Unit3.

Theories of thermal radiation; Absorption, reflection and transmission; Monochromatic and total emissive power; Black body concept; Planck's distribution law; Stefan Boltzman law; Wien's displacement law; Lambert's cosine law; Kirchoff's law; Shape factor; Heat Transfer between black surfaces.

Unit4.

Introduction; classification of heat exchangers; Logarithmic mean temperature Difference; Area calculation for parallel and counter flow heat exchangers; Effectiveness of heat exchangers; NTU method of heat exchanger design. Applications of heat exchangers

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 307E Industrial Engineering

L	T	P/D	Total		
3	1	-	4	Theory	: 100 marks
				Sessional	: 50 marks
				Duration of Exams.	: 03 hours

Unit1.

Introduction to work study, Method study, Basic procedure, Recording techniques (charts and diagrams), Elemental breakdown, Micro- motion studies, Therbligs, SIMO-chart, Principles of motion-economy.Introduction, Objectives, technique, (time) information recording, methods of timings, Time study allowances, Work sampling technique, Performance rating and its determination PMTS, M.T..M., Work factor.

Unit2.

Principles of organization, Importance and characteristics of organization, Organization theories- Classical Organization theory, Neo-Classical organization theory, modern organization theory. Types of organization-military or line organization, Functional organization, line and staff organization, Committees.Objectives of PPC, Functions of PPC, preplanning and planning, routing, estimating, scheduling – master schedule, daily schedule, Gantt chart, Dispatching-centralized vs.decentralized,control,follow up and progress reportingIntroduction, Product development, Product characteristics, Role of product development, 3S's –standardization, simplification and specialization.

Unit3.

Introduction, objectives and importance of sales forecasting, Types of forecasting, Methods of sales forecasting- Collective opinion method, Delphi technique, economic indicator method, regression analysis, Moving average method, time series analysis.Introduction, Functions of inventory, Types of inventory, Inventory Control- importance and functions, Inventory costs, Factors affecting inventory control, Various inventory control models, A B C analysis, Lead time calculations.

Unit4.

Introduction, Objectives, Concept & Life cycle of a product and V.E., Steps in VE., Methodology and technique, Fast diagram, Matrix method.

(a) Wages and Incentives: - concept, Types, Plans, desirable characteristics.

(b) Ergonomics: - Its importance, Man-machine work place system, Human factors considerations in system design.

(c) Supply Chain Management: - Its definition, concept, Objectives, Applications, benefits, some successful cases in Indian Industries.

(d) JIT: - Its definition, Concept, Importance, misconception, relevance, Applications, Elements of JIT (brief description).

(e) MRP: - Introduction, Objectives, factors, Guide lines, Techniques, Elements of MRP system, Mechanics of MRP, MRP-II.

(f) TIME MANAGEMENT: - Introduction, Steps of time management, Ways for saving time, Key for time saves.

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 309E Machine Design - I

L	T	P/D	Total		
2	-	5	7	Theory	: 100 marks
				Sessional	: 50 marks
				Duration of Exams. :	03 hours

Unit1.

Properties: chemical, physical, mechanical and dimensional; Ferrous metals, Non-ferrous metals, Plastics, Composite materials etc, Selection of Engineering Materials, Design methodology, Design criterion based on fracture, deformation and elastic stability, design stresses, factor of safety. Significant stress and significant strength, stresses-concentration, causes and mitigation, Endurance limit, Effect of concentration, Notch sensitivity, Size and surface finish, Goodman diagram, Gerber's parabola and Soderberg line.

Unit2.

Supports and retainment of rotating assemblies; manufacturing considerations in design, design of castings and weldments , Riveted joints for boiler shell according to I.B.R., riveted structural joint, and riveted joint with eccentric loading. Types of welded joints, strength of welds under axial load, Welds under eccentric loading, designation of various types of bolts and nuts, Design of bolted joints, Bolts of uniform strength, Bolted joints with eccentric loads, Design of Keys, Cotter joint and knuckle joints.

Unit3.

Design of shafts subjected to pure torsion, pure bending load, Combined bending & torsion, combined torsion, bending and axial loads.Introduction, hand and foot levers, cranked levers, lever for a lever safety valve, Bell crank lever, miscellaneous levers.

Unit4.

Types of shaft couplings, Design of sleeve or muff coupling, flange coupling and bush type flexible couplings. Introduction, Design of circular, oval shaped and square flanged pipe joints. Function, types of power screws, stresses in screws, design calculations.

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 313E Thermal Engineering Lab

L	T	P/D	Total	
-	-	2	2	

Practical : 25 marks
Sessional : 25 marks
Duration of Exams. : 03 hours

List of Experiments

1. To make a trial on single cylinder 4-stroke Diesel Engine to calculate B.H.P., S.F.C. and to draw its characteristics curves.
2. To make a trial on 4-stroke high-speed diesel engine and to draw its Heat Balance Sheet.
3. To make a trial on Wiley's jeep Engine at constant speed to calculate B.H. P., S.F.C., Thermal efficiency and to draw its characteristic Curves.
4. To make Morse Test to calculate IHP of the multi cylinder petrol engine and to determine its mechanical efficiency.
5. To calculate the isothermal efficiency and volumetric efficiency of a 2 stage reciprocating air compressor.
6. To find out the efficiency of an air Blower.
7. To make a trial on the Boiler to calculate equivalent evaporation and efficiency of the Boiler.
8. To study the following models:
   a) Gas Turbine.
   b) Wankel engine.
9. To study
   (a) Lubrication and cooling systems employed in various I. C. Engines in the Lab.
   (b) Braking system of automobile in the lab.
10. To study a Carburettor.
11. To study (I) the Fuel Injection System of a C.I. Engine.
    (II) Battery Ignition system of a S.I. Engine.
12. To study Cooling Tower.
13. To study multi Cylinder four strokes vertical Diesel Engine test RIG with Hydraulic Dynamometer.

Note: Out of above experiments 8 must be completed.

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 315E Fluid Machines (Practical)

L	T	P/D	Total	
-	-	2	2	

Practical : 25 marks
Sessional: 25 marks
Duration of Exams. : 03 hours

List of Experiments

1. To study and perform test on the Pelton wheel and to plot curves Q, P & η vs. N at full, three-fourth and half gate opening.

2. To study and perform test in the Francis Turbine and to plot curves Q, P, η Vs N at full, three-fourth gate opening.

3. To study and perform test on the Kaplan Turbine and to plot curves Q, P & η Vs N at full, three-fourth half opening.

4. To study and perform test on Centrifugal Pump and to plot curves H, P & η Vs. Q.

5. To study and perform test on a Hydraulic Ram & to find its Rankine & D' Aubussion η .

6. To study and perform test on a Reciprocating pump & to plot the curves Q, P & η Vs. H.

7. To study and perform test on a Gear Pump & to plot the curves Q, P & η Vs. Pressure rise.

8. Study and perform test on a Torque Convertor & to plot the curve η Vs. N_T / $N_{P.}$

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 317E Heat Transfer (Practical)

L	T	P/D	Total		
-	-	2	2	**Practical**	**: 25 marks**
				Sessional	**: 25 marks**
				Duration of Exams.	**: 03 hours**

List of Experiments

1. Determination of thermal conductivity of a metal rod
2. Determination of thermal conductivity of an insulating powder
3. Determination of thermal conductivity of a liquid using Guard-plate method
4. Determination of thermal resistance of a composite wall
5. Temperature distribution of a pin fins in free-convection.
6. Temperature distribution of a pin fin in forced-convection
7. Forced convection heat transfer from a cylindrical surface
8. Determination of Effectiveness of a Heat Exchanger
9. Determination of Stefan-Boltzman constant
10. Performance of Solar still
11. Determination of critical heat flux
12. Performance of solar water heater
13. Measurement of solar radiation using solar integrator.

Note: Out of above experiments 8 must be completed.

B.Tech. (Fifth Semester) Mechanical Engineering

ME- 319E Industrial Engineering (Practical)

L	T	P/D	Total		
-	-	2	2	**Practical**	**: 25 marks**
				Sessional	**: 25 marks**
				Duration of Exams.	**: 03 hours**

List of Experiments

1. To study various Rating Factor systems and find standard time for making small sand mould.
2. To study various plant layouts and suggest improvements in existing Machines Shop layout.
3. To study and draw organizational structure of a near by industry and suggest changes.
4. To draw X and R charts for a given sample of products to check their acceptance.
5. To draw p chart for a given product lot and verify its acceptance.
6. Draw a flow process chart with time estimates for a simple welding process.
7. Draw a two handed process chart for a simple process of a job preparation on a lathe.
8. To study various purchase procedures and draw organizational structure of college purchase dep't.
9. A case study on ABC/ VED analysis.
10. A case study on Quality Improvement Techniques (e.g. Hostel Mess/ Workshop/ Canteen etc.).
11. A market survey and analysis.
12. A "preliminary project report" preparation for any small-scale unit.

Note: Out of above experiments 8 must be completed.