Bachelor of Technology (Mechanical Engineering)Kurukshetra University, Kurukshetra

*SCHEME OF STUDIES/EXAMINATIONS(**w.e.f. 2015-16 onwards**)*

Semester – V

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hours/ Week	Theory	Sessional	Practical	Total	
1	ME-301N	I.C. Engine & Gas Turbine	3	1	0	4	75	25	0	100	3
2	ME-303N	Fluid Machines	3	1	0	4	75	25	0	100	3
3	ME-305N	Heat Transfer	3	1	0	4	75	25	0	100	3
4	ME-307N	Industrial Engineering	3	1	0	4	75	25	0	100	3
5	ME-309N	Machine Design-I	2	4	0	6	75	25	0	100	3
6	ME-311N	Production Technology-II	4	0	0	4	75	25	0	100	3
7	ME-313N	I.C. Engine Lab	0	0	2	2	0	40	60	100	3
8	ME-315N	Fluid Machines Lab	0	0	2	2	0	40	60	100	3
9	ME-317N	Heat Transfer Lab	0	0	2	2	0	40	60	100	3
10	ME-319N	Industrial Training (Viva-Voce)*	2	0	0	2	0	40	60	100	3
		Total	**20**	**08**	**06**	**34**	**450**	**310**	**240**	**1000**	

**The performance of the student will be evaluated after the presentation delivered and the report submitted by him/her related to Industrial training undertaken after IVth semester.*

B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Theory**	**Sessional**	**Total**	
ME-301N	**I.C. ENGINE & GAS TURBINE**	3	1	0	75	25	100	3
Purpose	Detailed study of engines, compressors and gas turbines.							
Course Outcomes								
CO1	Introduction to basic parts of engine and basic cycles.							
CO2	Study of carburettor, injection system and to understand the combustion process.							
CO3	Lubrication system of engine and its performance parameters.							
CO4	To study the compressors and gas turbines.							

UNIT 1

Heat engines; Internal and external combustion engines; Classification of I.C. Engines; Cycle of operations in four strokes and two-stroke IC engines; Wankle Engine.

Air standard cycles: 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 II

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; Type of injection system; 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 III

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 (BSFG, 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; 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.

UNIT IV

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; Application of gas turbines.

Text books:

1. Internal combustion engine by Ramalingam sci-tech publication
2. Internal combustion engine by Ganeshan TMG

Reference Books

1. Internal combustion engine by Mathur & Sharma
2. Heat power engineering by Dr. V.P. Vasandhani& Dr. D.S. Kumar

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Theory**	**Sessional**	**Total**	
ME-303N	**FLUID MACHINES**	3	1	0	75	25	100	3
Purpose	To make students aware of Momentum induced by Jets. Classification, Working & Design of Hydropower Plants, Turbines, Pumps and Hydraulic Machines.							
COURSE OUTCOMES								
CO1	Analysis of Momentum induced by Water Jets on stationary & moving; curved, flat & unsymmetrical single or multiple plates & vanes & on ships. Study of Dimensional Analysis Methods.							
CO2	Classification, Working, Design, Efficiencies, Characteristics & Model Testing of Hydraulic Turbines & study of Hydropower Plant & associated terms.							
CO3	Study of Classification, Working, Design, Efficiencies, Heads & Model Testing of Hydraulic Pumps.							
CO4	Study of various types of Hydraulic Machines.							

UNIT I

IMPULSE MOMENTUM BY WATER JETS: Impact of water jet: On Stationary &Moving Flat &Curved Plates, On Series of vanes Flat & Radial; Ship Propulsion by Jets; Numericals.

DIMENSIONAL ANALYSIS: Units and dimensions; Dimensional homogeneity; Dimensional analysis: Rayleigh Method & Buckingham's Pi-Theorem; Applications & limitations of dimensional analysis; Dimensionless numbers; Similitude laws; Numericals.

UNIT II:

HYDRAULIC TURBINES

INTRODUCTION: Classification of Hydraulic Machines; Hydropower plant& its Components; Surge tank and its type; Classification of turbines; Effective head, available power & Efficiencies.

PELTON TURBINE: Components; Work done & efficiency; Design: Number & Dimensions of Buckets, Speed ratio, Jet ratio, Run-away speed, jet velocity, mean wheel diameter, number of jets, maximum efficiency; Governing; Numericals.

FRANCIS TURBINE: Components; Work done & efficiency; Design: Runner, Width-Diameter ratio, Speed ratio, Flow ratio; Outward vs. Inward flow reaction turbines; Governing; Numericals.

AXIAL FLOW TURBINES: Propeller Turbine; Kaplan turbine; Components, Work done Power & Efficiency, Governing; Draft Tube: Efficiency &Types; Numericals.

DESIGN & OPERATIONAL PARAMETERS: Model testing of turbines; Specific Speed; Unit quantities; Performance Characteristic curves.

UNIT III:

HYDRAULIC PUMPS

CENTRIFUGAL PUMPS: Introduction; Components; Various Heads; Euler's head and its variation with vane shapes; Effect of finite number of vanes; Losses & efficiencies; Minimum starting speed; Limitation of suction lift; Net Positive Suction Head (NPSH); Priming; Cavitation and its effects, Cavitation parameters, Detection and Prevention of Cavitation; Multistage pumps; Specific speed and Performance; Numericals.

RECIPROCATING PUMPS: Introduction; Working principles; Classification; Components; Discharge Coefficient & slip; Work &Power input; Indicator diagram; Effect of Friction, Acceleration and Pipe friction; Maximum speed; Air vessels; Comparison with centrifugal pumps; Model testing of pumps; Numericals.

UNIT IV:

HYDRAULIC SYSTEMS

PUMPS: Propeller pump; Jet pump; Airlift pump; Gear pump; Screw pump; Vane pump; Radial piston pump; Submersible pump; Pump problems.

MACHINES: Hydraulic accumulators; Hydraulic intensifier; Hydraulic lift; Hydraulic crane; Hydraulic coupling; Torque converter; Hydraulic ram.

Text books:

1. Introduction to fluid mechanics and machinery by Som and Bishwas, TMH
2. A textbook of Fluid Mechanics & Hydraulic Machines by R. K. Bansal, Laxmi Publications

Reference Books:

1. Fluid mechanics and machinery by S. K. Aggarwal TMG
2. Fluid mechanics & fluid power engineering by D.S kumar, Katson publisher
3. Fluid mechanics and Hydraulic machine by S.S rattan, Khanna publisher

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Theory**	**Sessional**	**Total**	
ME-305N	**HEAT TRANSFER**	3	1	0	75	25	100	3
Purpose	To familiarize the students with the basic concepts of Heat Transfer.							
Course Outcomes								
CO1	Understand the basic modes of heat transfer and develop the general heat conduction equation.							
CO2	Analyse the one dimensional steady state heat conduction with and without heat generation.							
CO3	Determine the temperature distribution and effectiveness of extended surfaces.							
CO4	Differentiate between free and forced convection and discuss the dimensional analysis of free and forced convection.							
CO5	Understand the concept of hydrodynamic and thermal boundary layer and develop the related equations.							
CO6	Develop knowledge about the laws of thermal radiation and the concept of black body.							
CO7	Classify different types of heat exchangers and discuss LMTD and NTU approaches for the design of heat exchangers.							

UNIT I

Introduction: definition of heat, modes of heat transfer; basic laws of heat transfer, application of heat transfer, simple problems.

Conduction: Fourier equation, electrical analogy of heat conduction; thermal conductivity, the general conduction equation in cartesian, cylindrical and spherical coordinates, steady one dimensional heat conduction without internal heat generation: conduction through plane and composite wall, 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, unsteady heat conduction: lumped parameter analysis, introduction to Heisler charts.

UNIT II

Convection: Introduction: Newton's law of cooling, convective heat transfer coefficient, Nusselt number, convection boundary layers: Introduction of velocity and thermal boundary layers and its significance with respect to convection (without derivations of boundary layer equations), local and average convection coefficient, functional form of the solution of boundary layer equations, Physical significance of the dimensionless parameters, Reynolds analogy, ***External Forced Convection:*** Introduction to empirical method of solution, flow over a flat plate with both conditions of constant heat flux and constant temperature, cylinder in cross flow, flow over a sphere, ***Internal Forced Convection:*** Introduction to velocity profile, pressure gradient and friction factor in fully developed flow, mean temperature, energy balance considering constant surface heat flux and for constant surface temperature, convection correlations for laminar flow in circular tubes both in entry region and in the fully developed region, ***Natural convection:*** Physical considerations, governing equations (without derivations), functional form of the solution of governing equations, empirical correlations for external free convection flow over the vertical plate, horizontal and inclined plates, horizontal cylinder and sphere.

UNIT III

Radiation: fundamental concepts, absorption, reflection and transmission, black body concept, monochromatic and total emissive power, Planck's distribution law, Stefan Boltzman law, Wien's displacement law, Kirchoff's law, intensity of radiation, Lambert's cosine law, heat transfer between black surfaces, radiation shape factor, heat transfer between non-black surfaces: infinite parallel planes, infinite long concentric cylinders, small gray bodies and small body in large enclosure, electrical network approach, radiation shields.

UNIT IV

Extended Surfaces: governing equation for fins of uniform cross section, temperature distribution and heat dissipation rate in infinitely long fin, fin insulated at tip, fin losing heat at tip; efficiency and effectiveness of fins.

Heat Exchangers: classification of heat exchangers; overall heat transfer coefficient, logarithmic mean temperature difference, effectiveness of heat exchangers, NTU method of heat exchanger design, applications of heat exchangers.

Text books:

1. Fundamentals of Heat and Mass transfer – Frank P. Incropera, David P. Dewitt, T.L. Bergman and A.S. Lavine, Wiley Publications.
2. Heat Transfer: A Practical Approach - Yunus A Cengel, Tata McGraw Hill.
3. Heat Transfer – J.P. Holman, Tata McGraw Hill.

Reference Books:

1. A Text book of Heat Transfer - S.P Sukhatme, University press
2. Heat and Mass Transfer - D.S Kumar, S.K. Kataria& Sons
3. Heat and Mass Transfer – P.K. Nag, Tata McGraw Hill.
4. Heat Transfer – Y.V.C. Rao, University Press.
5. Heat Transfer – P.S.Ghoshdastidar, Oxford Press.

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B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Theory**	**Sessional**	**Total**	
ME 307N	**INDUSTRIAL ENGINEERING**	3	1	0	75	25	100	3
Purpose	To give the basic idea of industrial concept.							
Course Outcomes								
CO1	Introduction to different recording charts and technique.							
CO2	Understand the concept of industrial organization & ppc.							
CO3	Introduction, Objectives and importance of sales forecasting & inventory control.							
CO4	Introduction to wages, JIT, SCM, VE, TIME MANAGEMENT.							

UNIT I

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; techniques (time) information recording; methods of things, Time study allowances; work sampling technique, Performances rat ing and its determinant ion technique, Performance rating and its determination PMTS; M.T.M., Work factor.

UNIT II

Principle 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, Committee objectives of PPC; Functions of PPC Preplanning and planning; Routing; Estimating; scheduling; master schedule; Daily schedule; Gantt chart; Dispatching; centralized vs

UNIT III

Introduction, Objectives and importance of sales forecasting, Types of forecasting, Methods of sales forecasting, Collective opinion method, Delphi technique, economic indicator method; Regression analysis, introduction, Functions of inventory; Types of inventory; Control importance functions, Inventory costs, factors affecting inventory control, Various inventory controls models; A.B.C. analysis, lead-time calculations.

UNIT IV

Introduction, Objective; Concept and life cycle of a product and V.E.; Steps in V.E. Methodology and techniques, Fast diagram, Matrix method. Various concepts in industrial engineering.

a) WAGES AND INCENTIVES ; Concept ; Types, plans, Desirable characteristics.

b) SUPPLY CHAIN MANAGEMENT; Its Definition, Concept, Objectives, Applications, Benefits, some successful cases in Indian Industries.

c) JIT; Its definition, concept, importance, misconception, relevance, Applications, Elements of JIT (brief description)

d) TIME MANAGEMENT; Introduction, steps of time man agreement, Ways for saving time KEY for time saving.

REFERENCES AND TEXT BOOKS:

1. Industrial Engg. by M. Mahajan/Industrial Engg. by Savita Sharma.
2. Production planning and control by S. Elion.

3. Modern Production Management by S.S. Buffa.
4. Industrial Engg. and Management manufacturing system by Surender Kumar, Satya Parkashan.
5. Essence of Supply Chain Management by R.P. Monaty and S.G. Deshmukh.
6. Industrial Engg., and management by S. Sharma and Savita Sharma.
7. Industrial Engineering and management by I P Singh, Neelam Publications..

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		L	**T**	**P**	**Theory**	**Sessional**	**Total**	
ME-309N	**MACHINE DESIGN-I**	2	4	0	75	25	100	3
Purpose	To understand the fundamentals for solving engineering problems relating to machine components.							
Course Outcomes								
CO1	To design the machine components for static and fluctuating loads.							
CO2	To solve the design problems of different types of joints i.e. riveted joint, welded joint, cotter and knuckle joints under different loading conditions.							
CO3	To solve the design problems of transmission shafts, keys and lever for different loading conditions							
CO4	To solve the design problems of different types of couplings, pipe joints and crane hook.							

UNIT-I

Introduction: Design concepts, overall design considerations, codes and standards, methodology for solving machine component problems. **Engineering materials:** properties, ferrous metals, non-ferrous metals, plastics and composite materials, BIS system of designation of steels, selection of engineering materials.

Design against static load: Modes of failure, factor of safety, stress concentration: causes and mitigation, **Design against fluctuating load:** Fluctuating stresses, endurance limit, low cycle and high cycle fatigue, notch sensitivity, endurance limit-approximate estimation, reversed stresses-design for finite and infinite life, cumulative damage in fatigue, Soderberg and Goodman Lines, Modified Goodman Diagrams.

UNIT-II

Threaded Joints: Basic types of screw fastening, Bolts of uniform strength, locking devices, terminology of screw threads, ISO metric screw threads, materials and manufacture, design of bolted joints, bolted joints with eccentric loads. **Cotter and Knuckle Joints:** design of cotter and knuckle joints.

Riveted and Welded Joints: Riveted joints for boiler shell according to I. B. R., riveted structural joint, eccentrically loaded riveted joint, types of welded joints, strength of welds under axial load, welds under eccentric loading.

UNIT-III

Transmission Shafts: Shaft design on strength basis and torsional rigidity basis, ASME code for shaft design, design of hollow shaft on strength basis and torsional rigidity basis.

Keys: Design of square and flat keys.

Levers: Hand and foot levers, cranked lever, lever for a lever safety valve, Bell crank lever. Miscellaneous levers.

UNIT-IV

Couplings: Types of shaft couplings, design of sleeve or muff coupling, clamp coupling, rigid flange couplings and bushed-pin flexible couplings.

Curved Beams: Design of crane hook. **Pipe Joints:** Design of circular, oval shaped and square flanged pipe joints.

Text books:

1. Mechanical Engineering Design, Joseph E. Shigley and Charles R. Mischke, Tata McGraw Hill Book Co.
2. Design of Machine Element,V. B. Bhandari, Mc Graw Hill Edu. Pvt. Ltd.
3. Machine Component Design, Robert C. Juvinall and Kurt M. Marshek, Wiley India Pvt. Ltd.
4. Mechanical Design of Machine Elements and Machines, Collins and Busby, Wiley India Pvt. Ltd.

References books:

1. Machine Design by Sharma and Aggarwal
2. Machine Design-an integrated Approach, Robert L. Norton, Addison Wisley Longman
3. PSG Design Data Book by PSG college of Engineering, PSG Publication.
4. Design Data Hand book for Mechanical Engineers by K. Mahadevan and K. Balaveera Reddy.

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B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Theory**	**Sessional**	**Total**	
ME-311N	**PRODUCTION TECHNOLOGY-II**	4	0	0	75	25	100	3
Purpose	To understand the kinematics design of machine tools and working of traditional and non-traditional production processes.							
Course Outcomes								
CO1	To learn about kinematics of machine tools which drives classification of spindle speed on lathe, design of gearbox and geared head stock.							
CO2	To understand about thread manufacturing, gear production, generation and various process on gears including gear finishing etc.							
CO3	To understand the UCM process and details about machine tool vibrations.							
CO4	To analyse jigs and fixtures.							

UNIT-I

Machine Tool Power Drives:

Power sources used in Machine tools, estimation of power requirement for machine tool Drives, hydraulic drives in machine tools, Role and general constituents of the Kinematics Structure of machine tools, different forms of machine tool kinematic structure, mechanism. Commonly used in machine tool kinematic systems, method of changing speed feed in machine Tools, need of large no of speeds and feed in machine tools, method of changing speed and feed in machine tools.

Design of speed gearbox of machine tool, procedural steps in design of SGB, Layout of spindle speed in machine tools, selection of gear layout and ray-diagram for speed gearbox, determination of dimensions of the gears and shafts of speed gear box.

UNIT-II

Thread Manufacturing:

Thread casting, thread chasing, thread rolling, die-threading and tapping, thread milling, thread grinding, thread measurement and inspection.

Gear Manufacturing and finishing:

Introduction, Classification of gear production method, Gear generation processes: gear hobbing, gear shaping, rack planning. Gear finishing methods: shaving, roll finishing, burnishing, grinding, lapping, honing.

UNIT-III

Unconventional Machining processes:

Introduction, Need for unconventional processes, Classification of unconventional machining processes, process selection, Abrasive jet machining (AJM), Water jet machining(WJM), Ultrasonic machining(USM), chemical machining (CHM), Electrochemical machining (ECM), Electric discharge machining (EDM), Wire cut EDM, laser beam machining(LBM), Electron beam machining (EBM); their process parameters, Principle of metal removal , applications, advantages and limitations.

Machine Tools vibration:

Introduction, effects of vibration on machine tools, source of vibration, types of machine tool vibrations: and self-excited vibration (chatter), causes of self-excited vibration, chatter prediction, avoidance of chatter and vibration on existing machine tools and on proposed machine tools, vibration control and isolation.

UNIT-IV

Jigs and fixtures:

Introduction to Jig and fixtures, locating and clamping, design principles common to jig and fixtures, types of jig and fixtures, indexing jig and fixtures, automated jigs and fixtures.

Fundamentals jig and fixture design, jig and fixture construction, materials for jig and fixtures, tolerance and error analysis, analysis of clamping forces.

Text books:

1. Machining and machine tools by A.B. Chattopadhyay, Wiley India.
2. Fundamentals of metal cutting and machine Tools by Juneja, New age.
3. A text book of production engineering: Dr. P.C.Sharma, S Chand Technical.

Reference Books:

1. Tool design by Donaldson, TMH.
2. Workshop Technology, vol.-II: B.S.Raghuwanshi, Dhanpat Rai publications.
3. Production Technology: R.K. JAIN, Khanna Publishers.
4. Machine Tools: Dr. R. Kesavan & B.Vijaya, Ramnath, Laxmi publications.

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B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Sessional**	**Practical**	**Total**	
ME-313N	**I. C. Engine Lab**	0	0	2	40	60	100	3
Purpose	To understand the performance of C. I. and S. I. engines. Also to study cooling towers, boiler and detail parts of I C engines.							
COURSE OUTCOMES								
CO1	To understand the principle, construction and working of S.I. and C.I. engine.							
CO2	To calculate the performance parameters of reciprocating air compressor, petrol and diesel engine.							
CO3	To study lubrication, cooling systems of I C engine. Also to understand the braking system of automobile.							
CO4	To study boiler performance, fuel injection system of C I engine and brake ignition system of S I engine.							

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) Wankle 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 Carburetor.
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: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Sessional**	**Practical**	**Total**	
ME-315N	**FLUID MACHINES LAB**	0	0	2	40	60	100	3
Purpose	To provide students with practical knowledge of working of Hydraulic Turbines, Pumps and Machines.							
COURSE OUTCOMES								
CO1	Students will gain knowledge of the practical working of various hydraulic turbines.							
CO2	Students will gain knowledge of the practical working of various hydraulic pumps.							
CO3	Students will gain knowledge of the practical working of various hydraulic machines.							

LIST OF EXPERIMENTS

1. To study and perform lest on the Pelton wheel and to plot curves Q, P Vs N at full, three fourth gate opening.
2. To study and perform test in the Francis Turbine and to plot curves Q, P Vs N at full, three-fourth gate opening.
3. To study and perform test on the Kaplan Turbine and to plot curves Q, P Vs N at full, three-fourth half opening.
4. To study and perform test on Centrifugal Pump and to plot curves η, Power Vs Q.
5. To study and perform test on a Hydraulic Ram and to find its Rankine, Aubussion η.
6. To study and perform test on a Reciprocating pump and to plot the P and η Vs H.
7. To study and perform test on a Gear Pump and to plot the curves Q.P Vs Pressure rise.
8. Study and perform test on a Torque Convertor and to plot the curves η & Np.
9. To study and perform test on Submersible Pump and to plot curves η, Power Vs Q.
10. To study and analyse experimentally the Impact of Jet on flat vanes.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. 5th Semester Mechanical Engineering								
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Sessional**	**Practical**	**Total**	
ME-317N	**HEAT TRANSFER LAB**	0	0	2	40	60	100	3
Purpose	To familiarize the students with the equipment and instrumentation of Heat Transfer.							
Course Outcomes								
CO1	Design and conduct experiments, acquire data, analyze and interpret data.							
CO2	Measure the thermal conductivity of metal rod, insulating material and liquids.							
CO3	Understand the concept of composite wall and determine its thermal resistance.							
CO4	Plot the temperature profile in free and forced convection.							
CO5	Measure the performance of a heat exchanger.							
CO6	Understand the concept of solar heating and measure the performance of solar equipment.							

LIST OF EXPERIMENTS:

1. To determine the thermal conductivity of a metal rod.
2. To determine the thermal conductivity of an insulating slab.
3. To determine the thermal conductivity of a liquid using Guard plate method.
4. To determine the thermal conductivity of an insulating powder.
5. To determine the thermal resistance of a composite wall.
6. To plot the temperature distribution of a pin fin in free-convection.
7. To plot the temperature distribution of a pin fin in forced-convection.
8. To study the forced convection heat transfer from a cylindrical surface.
9. To determine the electiveness of a concentric tube heat exchanger.
10. To determine the Stefan-Boltzman constant.
11. To determine the critical heat flux of a given wire.
12. To study the performance of glass in glass solar collector.
13. To study the performance of an evacuated tube based solar water heater.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B. Tech. 5th Semester Mechanical Engineering							
ME-319N	**INDUSTRIAL TRAINING (VIVA-VOCE)**						
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Practical**	**Total**	**Duration of exam. (Hrs.)**
2	**0**	**0**	**-**	**40**	**60**	**100**	**3**

Student will submit summer training (about 8 weeks industrial training) report and Viva-voce will be conducted for his/her assessment.