Mechanical Engineering

L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination, B. Tech. (Mechanical Engineering)

Academic Semester V

S No	Subject Code	Board of Study	Subject	Periods per week			Scheme of Examination				Credits L + (T+P)/2
							PRE**		ESE*	Total Marks	
				L	T	P	Mid Sem.	TA			
01	MEE3114	Mechanical	Fluid Mechanics & Hydraulic Machinery	3	1	0	30	20	50	100	4
02	MEE3115	Mechanical	Internal Combustion Engines	3	1	0	30	20	50	100	4
03	MEE3116	Mechanical	Machine Tools & Machining	3	0	0	30	20	50	100	3
04	MEE3117	Mechanical	Energy Conversion Systems	3	0	0	30	20	50	100	3
05	MEE3118	Mechanical	Machine Tools & Machining Lab	0	0	3	0	30	20	50	2
06	MEE3119	Mechanical	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	0	30	20	50	2
07	MEE3120	Mechanical	Internal Combustion Engines Lab	0	0	3	0	30	20	50	2
08	MEE3121	Mechanical	Industrial Training & Seminar	0	0	2	0	15	10	25	1
09	HSS3103	Humanities	Humanities & Social Sciences	1	0	0	0	15	10	25	1
10	PFD3105	Humanities	Professional Development	0	0	1	0	15	10	25	1
TOTAL				**13**	**2**	**12**	**120**	**215**	**290**	**625**	**23**

* Report is missing

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Mechanical Engineering
(Detailed Syllabus of 5th Semester)
L: Lecture, T: Tutorial, P: Practical, C: Credit

SEMESTER V

CODE	SUBJECT	L	T	P	C
MEE3114	Fluid Mechanics & Hydraulic Machinery	3	1	0	4
MEE3115	Internal Combustion Engines	3	1	0	4
MEE3116	Machine Tools & Machining	3	0	0	3
MEE3117	Energy Conversion Systems	3	0	0	3
MEE3118	Machine Tools & Machining Lab	0	0	3	2
MEE3119	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	2
MEE3120	Internal Combustion Engines Lab	0	0	3	2
MEE3121	Industrial Training & Seminar	0	0	2	1
HSS3103	Humanities & Social Sciences	1	0	0	1
PFD3105	Professional Development	0	0	1	1
TOTAL		13	2	12	23

Assessment:

PRE			ESE
TA	Mid semester	Total	
20	30	50	50

PRE- Progressive Review Examination
TA- Teacher Assessment
ESE-End Semester Examination

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Semester: V **Branch: Mechanical Engineering**

Subject: Fluid Mechanics & Hydraulic Machinery **Code: MEE3114**

Course Objectives:

1. To familiarize with the properties of fluids and the applications of fluid mechanics.
2. To formulate and analyze problems related to calculation of forces in fluid structure interaction.
3. To apply conservation laws to fluid flow problems.
4. 4.The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications.
5. The ability to perform dimensional analysis and identify important parameters.
6. To understand boundary layer theory.
7. To understand construction, working and performance of various hydraulic machines.

Syllabus:

UNIT-1: Fluid statics and Kinematics:

A) Properties of fluid, Fluid Statics: Pressure, Pascal's law, Hydrostatic law, Manometry, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation.

B) Fluid Kinematics:Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, streak line, stream line, stream tube, Continuity equation, acceleration of a fluid particle, Rotational flow, Rotation and Vorticity, circulation, stream and potential function

UNIT-2: Fluid Dynamics

Fluid Dynamics: Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Pitot tube. Impulse momentum equation, Impact of Jets.

UNIT-3:Flow through pipes

A) Laminar Flow: Reynold's experiment, flow of viscous fluids in circular pipe, Hagen-Poiseuille Equation, Coutte flow.Turbulent flow: Effect of turbulence, Expression for loss of head due to friction in pipes (Darcy-Weisbach equation), Expression for co-efficient of friction in terms of shear stress.

B) Flow through pipe: Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe power transmission through pipe, water hammer in pipes.

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UNIT-4: Dimensional analysis and Boundary Layer theory:

A) Dimensional Analysis: Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, Limitations. Model analysis: Dimensionless number and their significance, model laws, Reynolod's model law, Fraude's model law, Euler's model law

B) Boundary Layer Theory: Boundary layer definition and characteristics, momentum equation, Laminar and turbulent boundary Layer, Total drag, separation and control, Drag and lift

UNIT-5: Hydraulic Machines:

Hydraulic Turbines: Classification of turbine, impulse turbine, Pelton wheel, Construction working, work done, head efficiency, Reaction Turbine : Radial flow reaction turbine, Francis turbine: construction, working, work done, efficiency, Axial flow reaction turbine Propeller and Kaplan turbine, draft tube, specific speed, unit quantities, cavitation.

Centrifugal Pumps: Classification of Pumps, Centrifugal pump, Construction, working, work done, heads, efficiencies, multistage centrifugal pump, pump in series and parallel. Reciprocating Pumps: Classification, component and working, single acting and double acting pump, discharge, work-done and power required, slip & coefficient of discharge.

Course Outcomes:

On successful completion of the course the student will be able to

1. 1.Identify and obtain the values of fluid properties and relationship between them and understand the principles of continuity, momentum, and energy as applied to fluid motions.
2. Analyze and design free surface and pipe flows.
3. Compute drag and lift coefficients using the theory of boundary layer flows.
4. Acquire knowledge and hands-on competence in applying the concepts of fluid mechanics and fluid machinery in the design and development of mechanical systems.

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Text Books:

1. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria& Sons – New Delhi
2. Introduction to Fluid Mechanics and Fluid Machines, S.K.Som,G.Biswas and S Chakraborty, Tata McGraw-Hill, 2011
3. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi
4. Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi, & SM Seth-Standard, Delhi

Reference Books:

1. Fluid Mechanics & Hydraulics Machines-R.K.Bansal-Laxmi Publications.,Delhi
2. Engineering Fluid Mechanics –K.L. Kumar, Eurasia Publication House, Delhi
3. Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH,Delhi
4. Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
5. Hydraulic Machines: Fundamentals of Hydraulic Power Systems – P. Kumar – BSP Books Pvt, Ltd., Hyderabad
6. Fluid Mechanics- Frank M White- TMH,Delhi
7. Fluid Mechanics- Fox and mcdonald- Wiley

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Semester: V **Branch: Mechanical Engineering**

Subject: Internal Combustion Engines **Code: MEE3115**

Course Objectives:

1. To understand the basic construction of IC Engines.
2. To understand the combustions systems.
3. To understand the ignitions systems in various IC Engines.
4. To perform the load analysis.

Syllabus:

Unit-1: Introduction:

Basic components and terminology of IC engines, working of four stroke/two stroke - petrol/diesel engine, classification and application of IC engines.

Fuel Air Cycles and Actual Cycles:

Assumptions for fuel–air cycles, Reasons for variation of specific heats of gases, change of internal energy and enthalpy during a process with variable specific heats, isentropic expansion with variable specific heats, effect of variable specific heats, dissociation, comparison of air standard and fuel air cycles, effect of operating variables, valve and port timing diagrams

Unit-2: Combustion:

Combustion equations, stoichiometric air fuel ratio, enthalpy of formation, adiabatic flame temperature, determination of calorific values of fuels – calorimeter*- Bomb and Junkers gas calorimeter.

Combustion in SI and CI Engines:

Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for SI engines, Stages of combustion in CI engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine

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Unit-3: Fuels and its supply system for SI and CI engine:

Important qualities of IC engine fuels, rating of fuels, structure and effect of fuel structure on combustion, volatility of liquid fuels and its effects, Carburetion, simple carburetor and its working, types of carburetors, types of injection systems in SI and CI engine, fuel pumps and injectors, types of nozzles, spray formation.

Unit-4: Measurement and Testing of IC engines:

Measurement of indicated power, brake power, fuel consumption and emission, Measurement of friction power by Willan's Line Method* and Morse Test, calculation of brake thermal efficiency, brake power and brake specific fuel consumption, heat balance sheet of IC Engines

Unit-5: Ignition and Governing System:

Battery and magneto ignition system, spark plug, firing order, quality, quantity & hit and miss governing

Engine Lubrication and Cooling:

Lubrication of engine components, Lubrication system – wet sump and dry sump, crankcase ventilation, Types of cooling systems – liquid and air cooled, comparison of liquid and air cooled systems

SI and Diesel Engine Emissions:

Nature and extent of problem Nitrogen oxides Carbon monoxide Hydrocarbons Particulates Emissions control strategies EURO (1-4) series & BHARAT series.

Course Outcomes:

1. Able to know the different advanced engines.
2. Able to analysis the difficulties in combustion systems.
3. Able to performance calculation on lubrication systems.

Text Books:

1. Ganesan V." Internal Combustion Engines", Fourth Edition, Tata McGraw-Hill, 2012
2. John B Heywood," Internal Combustion Engine Fundamentals", Tata McGraw-Hill1988
3. Heinz Heisler, 'Advanced Engine Technology," SAE International Publications, USA, 1998

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Reference Books:

1. Mathur, M.L., and Sharma, R.P., A Course in Internal Combustion Engines, Dhanpat Rai Publications Pvt.New Delhi-2,
2. Ramalingam. K.K., "Internal Combustion Engine Fundamentals", Scitech Publications
3. Engineering Fundamentals of the Internal Combustion Engine- Pulkrabek, Willard W-PHI Delhi
4. A Textbook of Internal Combustion Engine Dr.R.K.Singhal- Standard Book House, Delhi
5. Automotive Mechanics: Principles And Practices- W.H.Crouse, and D.L. Anglin, TMH ,Delhi
6. B. P. Pundir, "IC Engines Combustion and Emission" Narosa publishing house

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Semester: V **Branch: Mechanical Engineering**

Subject: Machine Tools & Machining **Code: MEE3116**

Course Objectives

The main objectives of the course are

1. To understand various machine tools & its classifications.
2. To understand various machining processes with its capabilities, advantages and the limitations.
3. To impart knowledge about cutting tool geometry, tool material, mechanics of metal cutting, machinability and importance of cutting fluid.
4. To understand the various drives, control and automation of machine tool.
5. To understand various unconventional machining processes and their applications.

Syllabus:

Unit-1: Machine Tools:

Concept and definition of machining and machine tools. History of developments of machine tools. Concept of producing geometrical surfaces by generatrix and directrix. Kinematic systems and structures of conventional machine tools. Classification, specification, Construction, working principle and application of following machine tools.

Lathe: operations-facing, turning, knurling, taper turning, thread cutting, drilling, boring, reaming, work holding devices & tools, mechanism and attachments for various operations, semi-automatic and automatic lathes. *Shaper:* Operations – horizontal cutting, vertical cutting, angular cutting, irregular cutting, Quick return Mechanisms. Table feed mechanism, work holding devices. *Planner.* Electromechanical and hydraulic drives and control of above machine tools. Machine tool automation.

Unit-2:

Classification, specification, Construction, working principle and application of following machine tools.

Milling: milling operations – plain, face, slotting, gear cutting mechanisms and attachments for milling, indexing-simple, compound and differential. Drilling: drill

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nomenclature, other operations like counter boring, counter sinking, spot facing etc. Reaming: description of reamers. Boring: boring operations, boring tools. Electromechanical and hydraulic drives and control of above machine tools. Machine tool automation.

Unit-3: Machining:

Cutting tools- types, requirements, specification and applications. Tool geometry, mechanism of chip formation. Mechanics of machining. Theories of metal cutting, types of chips, chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting.

Unit-4: Machinability:

Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life, Tool life equation, Machinability index, factors affecting machinability. Thermal Aspects in Machining and Cutting Fluid: Source of heat in metal cutting and its distributions, temp measurement in metal cutting, function of cutting fluid, types of cutting fluid. Cutting temperature causes, effects, estimation, measurement and control.

Unit-5: Special techniques and advanced technology of machining and grinding:

Processes, advantages, application and limitation - Electro Discharge Machining (EDM), Electro Chemical Machining (ECM), Ultrasonic Machining (USM), Abrasive Jet Machining (AJM), Electron Beam Machining (EBM), Laser Beam Machining (LBM).

Grinding: Processes, Grinding wheels, characteristics-abrasive type, grain size, bonding material, structure, and grade. Wheel specification and selection. Wheel life. Types of grinding operations, specification of grinding wheel, economics of grinding. Surface finishing operations: Honing, lapping, super finishing, polishing, buffing, process parameters and attainable grades of surface finish.

Course Outcomes:

1. Graduates will gain a strong foundation in machine tool engineering.
2. Acquire knowledge and hands-on competence in applying the concepts of manufacturing science in the design and development of mechanical systems.
3. Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
4. Develop an ability to identify, analyze and solve technical problems related to machine tools.

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5. Work effectively with engineering and science teams as well as with multidisciplinary designs.
6. Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

Text Books:

1. Manufacturing Technology (Vol. – I & II) – P.N. Rao – Tata McGraw Hill Pub. Company, New Delhi.
2. A Text Book of Production Technology (Manufacturing Processes) – P.C. Sharma – S. Chand and Company Ltd., New Delhi.
3. Machine Tool Engineering – G.R. Nagpal – Khanna Publishers, New Delhi.
4. A course in workshop Technology (Vol- I & II) – B.S. Raghuvanshi – Dhanpat Rai & Sons, New Delhi.

Reference Books:

1. Manufacturing Science – A. Ghosh & A.K. Mallik – East West Press Pvt. Ltd., New Delhi.
2. Manufacturing Engineering and Technology – S. Kalpakjian & S.R. Schmid – Addision Wesley Longman, New Delhi.
3. Production Technology – R. K. Jain – Khanna Publishers, New Delhi.
4. A Text Book of Production Technology (Vol. I & II) – O.P. Khanna – Dhanpat Rai & Sons, New Delhi.
5. Principle of Metal Cutting -Sen, Bhattacharya – New Central Book Agency, Calcutta.
6. Machine Tool Practices – Kibbe Richard R – PHI, New Delhi.
7. Donaldson, Cyril, George H. LeCain, V. C. Goold, and JoyjeetGhose. Tool design. Tata McGraw-Hill Education, 2012.
8. Chapman, W. A. J. Workshop Technology Part 1-3, 1998.
9. Juneja, B. L. Fundamentals of metal cutting and machine tools. New Age International, 2003.
10. HMT, H. M. T. Production technology. Tata McGraw-Hill Education, 2001.

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Semester: V **Branch: Mechanical Engineering**

Subject: Energy Conversion Systems **Code: MEE3117**

Course Objectives:

1. Explain the general principles and technology of energy systems.
2. Present a methodology of analyzing energy systems.
3. Survey the technological principles of solar energy in green building.
4. Introduce the principles of hydroelectric, geothermal, biomass, wave, and tidal energy.
5. Understand the Principles of Jet propulsion and rocketry

Syllabus:

Unit-1: Gas Turbines:

Classification of gas turbine. Simple open cycle gas turbine Ideal and actual cycle (Brayton Cycle) for gas turbine, Optimum pressure ratio for maximum specific output in actual gas turbine Regneration, reheat and inter cooling and effect of these modification on efficiency and output, closed cycle gas turbine.

Unit-2: Propulsion Devices:

Types of jet engines, Ram Jet, pulse jet, Turbojet, Turbo propulsion, principle and operation. Energy flow through jet and variation of pressure and temperature, thrust equation, specific thrust and velocity of fluid. Thermodynamics of turbojet, efficiency & performance, parameters affecting performance, after burn, Injection of water & alcohol mixture.

Unit-3: Renewable Energy Resources:

Introduction to world energy scenario, Renewable energy resources, Solar energy, earth sun angles, resolution, solar measurement, collection of solar energy, flat plate and focusing collector analysis, calculations and same design parameters. Applications of solar energy.

Solar photovoltaic system: Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system.

Unit-4: Bio Mass and Wind Energy:

A) Bio-Mass: Gasifiers, Gobar Gas plant, types of applications, Biomass conversion technologies, biogas Generation.

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B) Wind Energy: Basic principles of wind energy conversion, wind energy estimation, site selection consideration, basic components of wind energy conversion system, classification, advantages & disadvantages of WECS.

Unit-5: Additional Renewable Energy Resources:

Tidal energy and OTEC – Principle, resources and availabilities, energy conversion technologies.

Fuels cell technology, Principle of MHD power system, types of MHD system, advantages, materials for MHD system.

Geothermal energy, nature of geothermal fields, geothermal sources, prime movers for geothermal energy.

Course Outcomes:

1. Explain energy principles and how they relate to using renewable energy sources.
2. Describe the technology of each of the sources of renewable energy.
3. Explain economic issues around renewable energy sources.
4. Explain the basic working of Jet Propulsion and Rocketry

Text Books:

1. S. P. Sukhatme, Solar Energy - Principles of thermal collection and storage, second edition, Tata McGraw-Hill, New Delhi, 1996
2. Kothari D.P., "Renewable energy resources and emerging technologies", Prentice Hall of India Pvt. Ltd.
3. Non-Conventional Energy Sources - G.D. Rai – Khanna Publishers
4. Steam and Gas turbine – By R. Yadav - Central Publishing House, Allahabad

Reference Books:

1. Turbine compressors and Fans – S.M. Yahya– TMH
2. Gas Turbine Theory & Jet Propulsion – J.K. Jain – Khanna Publishers
3. Non Conventional Energy Sources – D.S. Chauhan – New Age International Pub.
4. Solar Energy – Garg & Prakash – TMH Pub.

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Semester: V **Branch: Mechanical Engineering**

Subject: Machine Tools & Machining Lab **Code: MEE3118**

Course Objectives:

1. To impart knowledge to students to develop their technical skill sets for creating entities from raw material.
2. To give "hands on" training and practice to students for use of various tools, devices, machines.
3. To develop ability of students to understand, plan and implement various processes and operations to be performed on the raw material to create object of desired shape and size.
4. To give exposure to inter disciplinary domains.

Laboratory Component: (the student should prepare minimum ten jobs on machine tool.)

Machine tools:

1. Operation of Taper turning and Thread cutting in a Lathe
2. Operation of Slot cutting in Shaper
3. Operation of Gear cutting in milling machine using indexing head.
4. Alignment testing of Lathe.
5. Operation of Drilling, boring and reaming of a hole.
6. Acceptance test of machine tool (radial drilling machine).
7. System compliance of machine tool (center lathe).

Machining:

8. Study of turning tool of Lathe (Tool signature) and resharpening of turning tool to specific geometry.
9. Study of twist drill and resharpening of drilling tool to specific geometry.
10. Study of dressing of grinding wheel.
11. Measurement of cutting forces and surface finish in turning, drilling, milling and grinding.
12. Measurement of cutting temperature and tool life in turning.
13. Machine setting and operation for spur/helical gear teeth cutting in milling.

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14. Inspection of screw threads
15. Inspection of gear teeth

List of Equipment/Instruments/Machines Required:

1. Lathe Machine
2. Shaper Machine
3. Radial Drilling Machine
4. Bench drilling machine
5. Universal Milling Machine
6. Bench Grinding Machine
7. Thermal Imager

Course Outcomes:

Upon successful completion of the course, students should be able

1. To explain the various parts and operation of lathe, shaper, milling, drilling, grinding machines.
2. To apply the knowledge of various operations such as Plain turning, taper turning, precision turning on lathe machine Thread cutting on lathe machine. Machining plain, horizontal and inclined surfaces on shaper machine.
3. To apply the knowledge of various operations such as precision turning on lathe machine, Boring and taper boring on lathe machine, External and internal thread cutting on lathe machine.
4. Ability of interpretation of job drawing, application of processes and operations to produce basic components from raw material.

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Semester: V **Branch: Mechanical Engineering**

Subject: Fluid Mechanics & Hydraulic Machines Lab **Code: MEE3119**

Course Objectives:

1. To impart the experimental skills in flow measurement and real fluid flow problems.
2. To impart knowledge in measuring pressure, discharge and velocity of fluid flow.
3. To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head.

List of Experiments: (At least twelve experiments are to be performed by each student)

1. To determine Meta centric height of floating body.
2. To verify Bernoulli's theorem experimentally.
3. To measure the velocity of flow using Pitot tube.
4. To determine the coefficient of discharge of Venturi meter.
5. To determine the coefficient of discharge of Orifice meter.
6. To determine the impact of jet through nozzle.
7. To determine the coefficient of discharge through open channel flow over a triangular notch.
8. To determine the coefficient of discharge through open channel flow over a rectangular notch.
9. To determine the different types of flow Patterns by Reynolds's experiment.
10. To determine the friction factor for different pipes.
11. Performance characteristics of Pelton Wheel Turbine
12. Performance characteristics of Francis Turbine
13. Performance characteristics of Kaplan Turbine
14. Performance characteristics of Variable Speed Centrifugal Pump
15. Performance characteristics of rated speed centrifugal pump
16. Performance characteristics of multistage centrifugal pump
17. Performance on Wind Tunnel (Open circuit Blower Type)

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Equipment/Machines/Instruments/Tools/Software Required:

1. Apparatus for determination of meta centric height
2. Bernoulli's apparatus.
3. Impact of jet apparatus.
4. Venturimeter Apparatus.
5. Orifice meter Apparatus
6. Pipe friction apparatus
7. Orifice apparatus
8. Mouth Piece apparatus with provision for determination of hydraulic coefficient Cc, Cd &Cv
9. Vortex flow apparatus
10. Reynolds's apparatus
11. Complete setup for flow measurement using Pitot tube
12. Complete set for open channel apparatus
13. Pelton Wheel Turbine
14. Francis Turbine Test Rig
15. Kaplan Turbine Test Rig
16. Variable Speed Centrifugal Pump Test Rig
17. Rated Speed Centrifugal Pump Test Rig
18. Multi Stage Centrifugal Pump Test Rig
19. Reciprocating Pump Test Rig
20. Complete setup of Wind Tunnel (Open circuit Blow type) with minimum wind speed not less than 30m/s.

Course Outcomes:

On successful completion of the course, student will be able to

1. Experiment with flow measurement devices like venturimeter and orifice meter, and determine their discharge coefficients.

2. Confidently design hydraulic machines, identify and select suitable turbines and pumps for different working conditions.

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Semester: V **Branch: Mechanical Engineering**

Subject: Internal Combustion Engines Lab **Code: MEE3120**

Course Objective:

1. To understand the working of various IC Engines.
2. To understand the heat distribution in Diesel & petrol Engines.
3. To understand the Ignition system in IC Engines.
4. To understand the valve timing in IC Engines.

List of Experiment

1. Sectional light weight models of IC Engine, Carburetor, sectional working model for 4 Stoke petrol engine
2. Sectional working model for four stroke cycle diesel engine
3. Performance test of 4 stroke Petrol Engine.
4. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed.
5. To study and conduct Morse Test on four-cylinder four-stroke Petrol Engine
6. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine by using gas analyzer.
7. Performance test on Single Cylinder 4 Stroke Variable Compression ratio Engine
8. Study of fuel supply system of a Diesel Engine (Fuel pump and Injector)
9. Study of Ignition System of IC engine.
10. Study of Valve timing and Port timing Diagram.

Course Outcomes:

1. Able to perform the load test and analyze.
2. Able to create better exhaust system.

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Semester: V **Branch: Mechanical Engineering**

Subject: Professional Development **Code: PFD3105**

Course Objectives:

The objectives of this course are:

1. To facilitate students' understanding of their own managerial skills.
2. To explain the basic concepts and processes of management;
3. To expose students to the managerial skills.
4. To expose students to several models of leadership and team building.
5. To explain the organizational culture and the complexity of managing in a global world.
6. To develop an ability to work with moral and ethical dilemmas and make decisions using criticalthinking.
7. To facilitate students' understanding of time management, empowerment and delegation.

Syllabus:

Unit-1: MANAGEMENT AND MANAGERIAL SKILLS

Management- Meaning, Nature and Concept of Management, Function of Management- Planning,
Organizing, Staffing and Controlling, Importance of Management, Role of Managers in Organization, Managerial Skills.

Unit-2: LEADERSHIP AND DECISION-MAKING SKILLS:

Leadership, Qualities of a Good Leader, Leadership Styles, Concept of Decision making-Importance of
Decision making, Decision making Process, Decision making Techniques.

Unit-3: PROBLEM-SOLVING SKILLS:

Problem-solving, Concept of Problem-solving, Process of Problem-Solving, Techniques for Problem-Solving, Challenges in Generating Creative Ideas.

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Unit–4: TEAM BUILDING AND TIME MANAGEMENT:

Team building, Developing Teams and Team Work, Leading Team, Team Membership. Time Management, Steps
and Techniques of Time Management, Importance of Time Management.

Unit-5: EMPOWERMENT AND DELEGATION:

Empowering and Delegating: Meaning of Empowerment, Dimensions of Empowerment, How to Develop Empowerment, Inhibitors of Empowerment, Delegating Works.

Course Outcome:

After completion of the course, students will be able to:

1. Distinguish between leadership and management;
2. Recognise their own leadership style;
3. Identify and understand various approaches in leading others;
4. Employ key competencies of visioning, aligning, delegation, motivating and inspiring others;
5. Recognise the need for collective problem solving and apply appropriate techniques.
6. Understand time pressures and the need for time management; and
7. Apply core management skills and techniques to deliver results.

Text Books:

1. Arbinger Institute, *Leadership and Self-Deception*, Berrett-Koehler Publishers; Second Edition, 2010, ISBN: 978-1576759776
2. Atul John Rego *How to develop a pleasing personality*, Better yourself bools, Mumbai,2006

Reference Books:

1. Dr. Ujjawal Patni & Dr. Pratap Deshmukh *The powerful Personality*, Fusion Books, 2006
2. Bennis, Warren. *On Becoming a Leader.* Rev. ed. Cambridge, Mass.: Perseus, 2003.
3. Bennis, Warren, and Joan Goldsmith. *Learning to Lead: A Workbook on Becoming a Leader.* 3d ed. Cambridge, Mass.: Perseus, 2003.

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