



Diploma in Mechanical Engineering
SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT*				
DTME401		PRODUCTION MANAGEMENT AND INFORMATION SYSTEMS	60	20	20	0	0	2	1	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) This subject aims at introduction of basic concepts of production management & principles of production management. (B) It covers the optimization of factory resources. (C) It also includes understand the processing of various jobs in industries. (D) Student will understand role of Industrial engineering department in the industry.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. To understand the functioning of manufacturing organizations.
2. To understand optimization of factory resources.
3. To understand the processing of various jobs in industries.
4. To understand role of Industrial engineering department in the industry.
5. To understand various components of management.

Syllabus

UNIT - I

Introduction and Management Process: Definition, objectives, functions, organization structure; Types of production; Production procedure; what is Management? Evolution, various definitions, Concept of management, Levels of management, Administration & management scientific management by F.W. Taylor; Principles of Management (14 principles of Henry Fayol) Functions of Management Planning, Organizing, Directing and Controlling; Organizational Management Organization - Definition Steps in organization; Types of organization- Line & staff Functional Project.


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UNIT -II

Product development & Design: Marketing aspect; product characteristic; economic analysis-profit consideration, standardization, simplification and specialization; Production aspect; break even analysis -concept & problems; Make or Buy Decisions - Functional aspects of Make or Buy Decisions; Economic and Non-Economic Factors influencing Make or Buy Decisions.

UNIT -III

Linear Programming: Linear programming in multi-product system; Formulation of Linear Programming Problem (LPP) and problems on graphical solution only.

Plant Layout, Material Handling: Study of plant layout; flow systems; types of layout requirements of good plant layout; different material handling equipment; Productivity-Definition, benefits, measures of effectiveness; factors affecting; Productivity improvement techniques.

UNIT -IV

Inventory Control: Types of inventories; ABC analysis; concepts of Economic Order Quantity (EOQ), inventory control with deterministic demand; instantaneous and gradual replenishment; quantity discount, shortages; Problems on Simple inventory control model without shortages; Project Management: Critical path method (CPM) and Program Evaluation & Review Technique (PERT); Simple problems on PERT / CPM.

UNIT -V

Work Study : Definition, need, method study procedures; Flow Diagrams, String Diagrams, Process charts: Outline process chart; Flow Process Chart, Multiple activity chart, Travel chart, Workplace layout design; Principles of Motion Economy; Two handed process chart; Work measurement: Work Sampling, Time study – procedures & equipments, performance rating, allowances, calculation of standard times, Predetermined Time Standards (PTS); MTM techniques.

References Books:

1. "Martand Telsang", "Industrial Engineering & Production Management", S. Chand & Co. Ltd.2010
2. "M. S. Mahajan", "Industrial Engineering. And Production Management", "Dhanpat Rai & Co.2006.
3. "Banga & Sharma", "Industrial Organization & Management", 2010.
4. "P. K. Gupta, & D. S. Hira", "Operations Research", S. Chand, 2018.


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			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT*				
DTME402		THEORY OF MACHINES	60	20	20	30	20	2	1	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) To familiarize students with basic types of mechanisms, joints and degrees of freedom to perform position, velocity and acceleration analysis using graphical and analytical methods. (B) To provide students an understanding of different types of mechanisms and to teach the basics of synthesis of simple mechanisms and also teach students the kinematic analysis of cam-follower motion. (C) To provide basic concept gyroscope, which allows the calculation of orientation and rotation; designers have incorporated them into modern technology.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Students will be able to define systematically design and develop mechanisms to perform a specified task and demonstrate an understanding of the concepts of various mechanisms and pairs.
2. Students will be able to do the velocity and acceleration analysis of simple mechanisms.
3. Students will be able to explain effectively present written, oral, and graphical solutions to design problems & develop ability to come up with innovative ideas and design a layout of cam for specified motion.
4. Students will be able demonstrate an understanding of principle of gears.
5. Students will be able to synthesis simple gyroscopic forces and couple, and gyroscopic effect in airplanes, ship and vehicle.


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Syllabus

UNIT-I

Simple Mechanism: Introduction of theory of machines; definitions of statics, dynamics, kinematics, kinetics, kinematic pair, kinematic chain, mechanism, machine inversions, relation between number of links, number of joints and number of pairs; Four bar chain and its inversion; Slider crank chain and its inversions.

UNIT-II

Dynamic force analysis, Crank Effort Diagrams and Flywheel: Dynamics of reciprocating engine mechanism; Inertia force due to reciprocating mass; piston effort crank effort, turning moment on crank shaft; Analytical and graphical methods of construction of turning moment diagrams for steam and I.C. Engines; Fluctuation of energy and speed; Coefficient of fluctuation of energy and speed; Flywheel and its function; calculation of moment of inertia; Weigh of flywheel for steam and I.C. Engines.

UNIT-III

Brakes and Dynamometers: Brakes-Need, types, braking force, braking torque; Band brakes; block brakes; Band and Block brakes; internally expanded brakes; Dynamometers-Need, Types, principles, Construction and working.

UNIT-IV


Power Transmission: Classification of power transmission devices, belt drive, chain drive, rope drive and gear drives; Flat and 'V' belt drives; ratio of tensions; Slip length of belt calculation for open and cross belt drive.

UNIT-V

Governors: Classification of governors, Watt governor, porter governor, proell governor and hartnell governor-their construction and working; Sensitivity; stability; power and effort; hunting phenomenon and isochronous governor; Cams and Followers-Need, Classification, motion of follower; Displacement, velocity and acceleration diagrams uniform velocity, uniform acceleration and retardation.

Reference Books:

1. S.S. Rattan, "Theory of Machines", Third Edition, Tata McGraw-Hill, 2009.
2. Ambekar A.G, "Mechanism and Machine Theory" Prentice Hall of India", New Delhi, 2007.
3. Rattan SS; "Theory of machines"; MC Graw Hills, 2014.
4. Ambekar AG; "Mechanism and Machine Theory; PHI. Eastern Economy Edition", 2015.
5. Rao J S and Dukkupati; "Mechanism and Machine Theory"; New Age Delhi, 2011.


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List of Practical's:

1. To find out gyroscopic couple.
2. To Find out velocity & acceleration of slider crank mechanism by Klien's Construction.
3. To find out velocity ratio of various gear trains
4. To study various types of belt drives & find out the velocity ratio of the drive.
5. To draw the cam profile.
6. Study of working models of various popular mechanisms like quick return mechanism etc
7. To draw Involute profile of a gear by generating method.
8. Study of the mechanisms like Pantograph mechanism, Davis & Ackerman's steering mechanisms etc.

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			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT*				
DTME403		MANUFACTURING TECHNOLOGY	60	20	20	30	20	2	1	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) The course is designed to give fundamental knowledge basic manufacturing processes for manufacturing different components. (B) To understand the basic, Operate & control different machines and equipment's. (C) To understand the basic concept, inspect the job for specified dimensions. (D) To understand the basic concept of selection of the specific manufacturing process for getting the desired type of output.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student will Know and identify basic manufacturing processes for manufacturing different components.
2. Student will be Know About Operate & control different machines and equipments.
3. Student will be able inspect the job for specified dimensions.
4. Student will know about basic concept of produce jobs as per specified dimensions.
5. Student will be known selection of the specific manufacturing process for getting the desired type of output.

Syllabus

UNIT- I

Lathes: Introduction of lathes; Basic parts and functions; Types of Lathe; Concept of ram or capstan type and turret or saddle type machine; Principal parts of capstan and turret lathes; Tool holding devices; slide tool holder; knee tool holder; knurling tool holder; recessing tool holder; form


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tool holder; Tap and Die holder; V-steady box tool holder; roller steady box tool holder.

UNIT- II

Drilling, Reaming & Boring Machine: Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers; Twist drill nomenclature; cutting parameters; machining time calculation; Work and Tool Holding Devices; Horizontal Boring Machines; Vertical Boring Machines; Jig Boring Machine; Size of Boring Machines.

UNIT-III

Milling Machine: Classification; Basic parts and their functions-column and knee Type; Types of milling operations, Types of milling cutters; cutting parameters; machining time calculation; milling operations-plain milling, side and face milling, form milling, gang milling, end milling, face milling and T- slot milling; Work and Tool Holding Devices; Dividing Heads.

UNIT-IV

Grinding machine, Broaching Machine & Gear Manufacturing: Grinding wheel composition, types and shapes; Designation; Types of grinding operations; Types of Broaching machine; Advantages, Limitation and applications of broaching; Broach Size and Materials; Methods of manufacture Gear cutting by (i) milling, (ii) single point cutting tool on planer/shaper, (iii) Shear speed process (iv) Gear planning, (v) Gear Shapers & Gear hobbling.

UNIT -V

Nontraditional machining processes: Electrical discharge Machining-Principle of working, Setup of EDM, Dielectric fluid, tools (electrodes), Process parameters and applications; Laser Beam Machining-principle of Laser, working, construction, Set-up for LBM, Characteristics, controlling Parameters, Application of Laser Beam for Welding (LBW); Nontraditional machines such as EBM, ECM and CHM with their Principle of working and applications; Introduction to NC, CNC, DNC, Semi-Automatic and Automatic Machines.

Reference Books:

1. *Production Technology- P.C. Sharma, S. Chand, 2005.*
2. *Manufacturing Technology R.K. Rajput Laxmi Publication, 2006.*
3. *Basic Manufacturing Processes & workshop Technology- S.K. Garg, 2010.*


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List of Practical's:

1. Demonstration of formation of chips on a lathe, continuous, discontinuous and fractured by changing variables like rake angle.
2. Measuring of angles of a single point tool with reference to main plane with the aid of tin templates.
3. Grinding of single point (H.S.S.) tools.
4. Practice of taper turning and screw cutting on a centre lathe.
5. Practice of making the pins or rivets of any size on a capstan lathe.
6. Practice of drilling, boring and reaming on a lathe.
7. Practice of mounting cutters on the milling m/c and setting of m/s.
8. Practice of up milling and down milling operation.
9. Practice of cutting the spur gear on milling machine.
10. Practice on a shaper square block on a shaper and milling machine (Comparison of surface produced).

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT*				
DTME404		FLUID MECHANICS	60	20	20	30	20	2	1	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

- (A) The course is designed to give fundamental knowledge of fluid, its properties and behavior under various conditions. (B) To understand the basic concept of fluid mechanics. (C) To understand the basic concept of Impact of Jet & Hydraulic Turbines. (D) To understand the basic concept and principal of pump.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student will be able to understand statics, dynamics and various approaches to fluid mechanics.
2. Student will be able to understand fundamentals of flow through pipes.
3. Student will be able to understand basics of compressible flow.
4. Student will be able to correlate fundamentals of fluid mechanics with various mechanical systems.
5. Student will be able to understand basic principal of pump.

Syllabus

UNIT -I

Properties of fluid: Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillary Tube, Vapour Pressure and Compressibility.


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UNIT-II

Pressure Measurement Devices: Fluid pressure, Pressure head and Pressure intensity; Concept of absolute vacuum, gauge pressure, atmospheric pressure and absolute pressure; Simple and differential manometers; Burden pressure gauge; Concept of Total pressure on immersed bodies; center of pressure; Numerical on Manometers; Total Pressure and Centre of pressure.

UNIT- III

Fluid Flow & Flow through Pipes: Types of fluid flows; Continuity equation; Bernoulli's theorem; Venturimeter-Construction, principle of working, Coefficient of discharge, Derivation for discharge through Venturimeter; Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter; Pitot tube-Construction, Principle and Working; Laws of fluid friction(Laminar only); Darcy's equation and Chery's equation for frictional losses; Minor losses in pipes; Hydraulic gradient and total gradient line; Hydraulic power transmission through pipe.

UNIT- IV

Impact of Jet & Hydraulic Turbines: Impact of jet on fixed vertical, moving vertical flat plates; Impact of jet on curved vanes with special reference to turbines & pumps; Classification of hydraulic turbines; Selection of turbine on the basis of head and discharge available; Construction and working principle of Pelton wheel, Francis and Kaplan turbine; Draft tubes-types and construction; concept of cavitations in turbines; Calculation of Work done, Power and efficiency of turbine.

UNIT – V

Pumps: Construction, principle of working and applications; Types of casings and impellers; Concept of multistage; Priming and its methods; Cavitations; Manometric head, Work done, Manometric efficiency; Overall efficiency; NPSH; Performance Characteristics of Centrifugal pumps.

Reference Books:

1. *Fluid Mechanics and Hydraulic Machines* by Dr. R.K. Bansal, 2009.
2. *Engineering Fluid Mechanics* by K. L. Kumar, 2013.
3. *Fluid Mechanics* by Victor L. Streeter, Benjamin Wylie Ninth, 2004.
4. *Fluid Mechanics* by Frank M. White, 2000.
5. *Fluid Mechanics* by Robert Fox, Alan McDonald, 2003.
6. *Fluid Mechanics* by Yunus A. Cengel, John M. Cimbala, 2007.


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List of Practical's:

1. Verifying the Bernoulli's Theorem.
2. Determination of co-efficient of discharge of a mouth piece and orifice by variable head method.
3. Determination of co-efficient of discharge of a venturimeter and orifice meter.
4. Determination of the Friction Factor in a pipe.
5. Performance test on reciprocating pump and to draw the characteristics curves.
6. Performance test on centrifugal pump and to draw the characteristics curves.
7. Performance test on impulse turbine and to find out the Efficiency.
8. Performance test on reaction turbine and to find out the Efficiency.


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ML-301 ENVIRONMENT AND ENERGY STUDIES

SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment ^{nt*}	END SEM University Exam	Teachers Assessment ^{nt*}	L	T	P	CREDITS
ML-301	Compulsory	Environment and Energy Studies	60	20	20	0	0	4	0	0	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

*Teacher's Assessment shall be based upon following components: Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives :

1. Understand sources of information required for addressing environmental challenges.
2. Identify a suite of contemporary tools and techniques in environmental informatics.
3. Apply literacy, numeracy and critical thinking skills to environmental problem-solving.

Course Outcomes

1. Apply the principles of ecology and environmental issues that apply to air, land and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community.

Unit I: Environmental Pollution and Control Technologies - Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

Unit II: Natural Resources - Classification of Resources: Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources:

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Growing energy needs, renewable energy source, case studies.

Unit III: Ecosystems: Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, Ecosystem Value, Devices and Carrying Capacity, Field visits.


Unit IV: Biodiversity and its Conservation - Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man wild life conflicts; Conservation of biodiversity: In-situ and Ex-situ conservation. National Biodiversity Act.

Unit V: Environmental Policy, Legislation & EIA - Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP)

Recommended Readings:

1. Agarwal, K.C. (2001). *Environmental Biology*. Bikaner: Nidi Pub. Ltd.
2. Brunner, R.C. (1993). *Hazardous Waste Incineration*. New Delhi: McGraw Hill Inc.
3. Clank, R.S. (2001). *Marine Pollution*. New York: Oxford University Press.
4. De, A.K. (2001). *Environmental Chemistry*. New Delhi: Wiley Western Ltd.
5. Bharucha, Erach (2005). *Environmental Studies for Undergraduate Courses*. New Delhi: University Grants Commission.
6. Rajagopalan, R. (2006). *Environmental Studies*. New York: Oxford University Press.
7. AnjiReddy, M. (2006). *Textbook of Environmental Sciences and Technology*. BS Publication.
8. Wright, Richard T. (2008). *Environmental Science: towards a sustainable future*. New Delhi: PHL Learning Private Ltd.
9. Gilbert M. Masters and Wendell P. Ela (2008). *Environmental Engineering and science*. University Kindom: PHI Learning Pvt Ltd.
10. Botkin, Daniel B. & Edwards A. Keller (2008). *Environmental Science*. New Delhi: Wiley INDIA edition.
11. Kaushik, Anubha (2009). *Environmental Studies*. New Delhi: New age international publishers.

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			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESMENT*				
DTME405		WORKSHOP PRACTICES	0	0	0	60	40	0	0	6	3

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) To acquaint students with the basic concepts of various machining processing. (B) To impart a fundamental knowledge of casting processing. (C) Selection and application of different metal forming processing. (D) To understand the basic concepts and principal of Welding.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student will be able to understand of various machining processing.
2. Student will be able to understand of various casting processing.
3. Student will be able to understand of different metal forming processing.
4. Student will be able to understand of various Welding process and their application in machining processing.

List of Practical's:

1. Machining
 - A. Basic operations on lathe, shaper, milling, drilling and grinding machines.
 - B. To perform step turning, knurling and threading operations on lathe.
 - C. To prepare a simple job on shaper.
2. Foundry, Moulding and casting of
 - A. Solid bearing
 - B. Flange coupling


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- C. Split bearing
 - D. Connecting rod
 - E. V – Pulley
 - F. Gear pulley
3. Forging Shop
- A. Conversion of Round to square.
 - B. Conversion of Round to Hexagon.
 - C. Preparation of Chisel from round rod.
 - D. Preparation of ring and hook from M.S. Round.
 - E. Preparation of a hexagonal bolt and nut.
4. Sheet Metal Work
- A. Practice on cutting of sheet
 - B. Formation of joints like grooved joints, locked groove joint
 - C. Preparation of a rectangular open type tray
 - D. Preparation of hollow cylinder
5. Welding
- A. Practice on MIG Welding Machine
 - B. Practice on Spot Welding Machine
 - C. Practice on Electric Arc Welding Machine
 - D. Practice on Gas Welding Machine
 - E. Practice on TIG Welding Machine


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