

Second Year, Second Semester Diploma Mechanical Engineering

 सत्यं शिवं सुन्दरम् Estd. 1949 Accredited Grade "A+" by NAAC	The Maharaja Sayajirao University of Baroda Polytechnic, Department of Mechanical Engineering Near Shastri Bridge, Fatehgunj, Vadodara 390002 Ph: 02652783914-15 email: principal-poly@msubaroda.ac.in		Last Revision 2018-19 Implemented Progressively
Second Semester Second Year Diploma Mechanical			
Year: II	MECHANICAL DRAFTING (MEC3411)	MARKS	100(P)+50(T.W/ VIVA)
Semester: II		HOURS	60(L)+60(P)=120
Course Outcomes	CO1 Specify concept of fasteners and assembly of different machine parts with sectional view using manual drawing facility CO2 Introduce understanding of development of sheet metal component associated with pipe joints transits and oblique component used in industry. CO3 Significance of penetrations for different solid shapes CO4 Justify the concept and construction of nomography. CO5 Reproduction ability to draw details from assembly drawing of machine element and give surface roughness symbol.		

Unit No.	Content	Contact hours	Theory Marks
I	ASSEMBLY DRAWING	12	28
	Assembly and details of different parts of jigs and fixtures and machine parts such as Clapper Box, Tail Stock, Clutches, Coupling et		
II	PRODUCTION DRAWING	10	15
	Production drawing with tolerances, Frame symbols of surface finish etc, Foundry Drawing, Pattern Drawing, Duplicating and Tracing, Production and Layout Drawing such as Planning Layout etc		
III	ADVANCED DEVELOPMENT & PENETRATION OF SOLIDS	30	34
	Penetration of Solids with practical applications (cone to cone penetrations also) Advance problems on developments.		
IV	NOMOGRAPHS	04	07
	Nomographs and Charts, Bar Chart, Pie Chart, Construction of two and three variables 09 conversions scale, Parallel Scale, Monographs, N chart monograph etc.		
V	FREE HAND SKETCHES	04	16
	Freehand sketches of machine parts, Gear, Pipe Joints, Welded Joints, Riveted Joints, 06 Ducts etc. I.S. Symbols, Machine Symbols, other standard symbols used in engineering practice (From IS -696 -9972 and latest) Folding of prints		
REFERENCES			
1.	Machine Drawing – S.S. Gill		
2.	Machine Drawing – C.L. Verma		

Second Year, Second Semester Diploma Mechanical Engineering

 सत्यं शिवं सुन्दरम् Estd. 1949 Accredited Grade "A+" by NAAC		The Maharaja Sayajirao University of Baroda Polytechnic, Department of Mechanical Engineering Near Shastri Bridge, Fatehgunj, Vadodara 390002 Ph: 02652783914-15 email: principal-poly@msubaroda.ac.in		Last Revision 2018-19 Implemented Progressively	
Second Semester Second Year Diploma Mechanical					
Year: II		THERMAL ENGINEERING – I (MEC3412)		MARKS	100(P)+50(T.W/ VIVA)
Semester: II				HOURS	60(L)+30(P)
Course Outcomes		CO1 Apply the thermodynamic concept and laws to the thermal systems for analysis. CO2 Perform the analysis of the various thermodynamic processes and cycles. CO3 Demonstrate various types of boilers and calorimeters for various fuels. CO4 Compute the performance of boiler and air – fuel quantity for combustion process.			
Unit No.	Content			Contact hours	Theory Marks
UNIT-I	BASIC CONCEPTS OF THERMODYNAMICS			10	17
	Microscopic & macroscopic point of view, Thermodynamic system, surrounding, boundary and control volume, State, Processes and cycles, Thermodynamic properties, Concept of energy, Work, Heat, Potential energy, Internal energy, Kinetic energy and enthalpy, Thermodynamic equilibrium, Quasi-static process, Pure substance, vapour liquid- solid phase in a pure substance, vapour liquid- solid phase in a pure substance, p-v-t surface, Critical and triple point of pure substance				
UNIT-II	FIRST LAW OF THERMODYNAMICS			06	08
	Zeroth law of Thermodynamics, First law of Thermodynamics, First law for a closed system undergoing a cycle and system undergoing a change of state, Steady flow energy equation applied to nozzle, Diffuser Boiler, Turbine, Compressor, Pump, Heat exchanger and Example, Limitation of First law of Thermodynamics				
UNIT-III	SECOND LAW OF THERMODYNAMICS			05	08
	Concept of Heat reservoir, source and sink Heat engine, Heat pump and refrigeration Kelvin-Planck and Clausius statements and their equivalence, Perpetual motion machine of the second kind, Concept of reversibility and irreversibility of Thermodynamics processes. Concept of entropy, Example				
UNIT-IV	PROPERTIES OF GASES			09	15
	Boyle's law, Charle's law and combine law, Perfect gas and Characteristic equation for a perfect gas Specific heats of gas and its relation with gas constant and other Thermodynamic processes: Constant volume, Constant pressure, Isothermal, Frictionless adiabatic (isentropic), Polytropic and Throttling process. Examples				
UNIT-V	THERMODYNAMIC CYCLES			10	20
	Concept of air standard efficiency, General assumptions for deriving air standard efficiency Classification of cycles, Carnot cycle and Carnot vapour cycle, Otto cycle, Diesel cycle and Dual cycle, their expression for the thermal efficiency, Limitations and applications, Brayton cycle and its expression for the thermal efficiency, Limitations and applications Rankine cycle and its expression for the thermal efficiency, Limitations and applications Examples				
UNIT-VI	PROPERTIES OF STEAM			06	10
	Formation of steam at constant pressure Enthalpy of water, Enthalpy of evaporation, Enthalpy of (i) Dry and saturated steam (ii) Wet steam (iii) Superheated steam Specific volume of steam, Use of steam tables, Mollier chart and its examples.				

Second Year, Second Semester Diploma Mechanical Engineering

UNIT-VII	STEAM GENERATORS	06	08
	Classification of boiler, Comparison between water and fire tube boilers Factors for boiler selection, Boiler mountings and accessories, Necessity of high pressure steam boilers, Construction and working of high pressure boiler, Boiler Draught – Natural and artificial, Boiler performance, testing and heat balance sheet Inspection and safety precaution in boiler house (as per IBR).		
UNIT-VIII	FUELS	08	14
	Types of fuel, Solid fuel – Natural and Artificial, Calorific values and their measurement – carbon value, evaporative power, theoretical value, experimental value, Liquid fuel, bomb calorimeter Gaseous fuel, Junker’s gas calorimeter, Calculation of H.C.V and L.C.V of solid, liquid and gaseous fuel. Combustion equation for solid and gaseous fuel, Minimum air required for complete combustion, mass of carbon in flue gases, mass of flue gas per kg of fuel burn, Volumetric and weight analysis of fuels, conversion of volumetric to weight analysis and weight to volumetric analysis Excess air and total air required for combustion of fuels Examples		
REFERENCES			
1.	Engineering Thermodynamics by P. K. Nag		
2.	Basic engineering thermodynamics by Renyer Joel		
3.	Elements of Heat Engine Vol. I, II & III by R.C. Patel		
4.	Thermodynamics by R. Yadav		
5.	Heat engines by P. L. Ballany		
6.	Thermal engineering by R. S. Khurmi		
7.	Thermal Engineering by Mathur & Sharma		

 सत्यं शिवं सुन्दरम् Estd. 1949 Accredited Grade "A+" by NAAC	The Maharaja Sayajirao University of Baroda Polytechnic, Department of Mechanical Engineering Near Shastri Bridge, Fatehgunj, Vadodara 390002 Ph: 02652783914-15 email: principal-poly@msubaroda.ac.in		Last Revision 2018-19 Implemented Progressively
Second Semester Second Year Diploma Mechanical			
Year: II	ELEMENTS OF MACHINE DESIGN (MEC 3413)	MARKS	100(P)+50(T.W/VIVA)
Semester: II		HOURS	45(L)+60(P)
Course Outcomes	CO1 Understand the steps involved in the design process considering the factor of safety. CO2 Identify the type of failure and determine the size of machine elements which are subjected to simple axial load. CO3 Apply the knowledge of temporary and permanent joints to compute the various dimensional parameters using failure theories. CO4 Determine and select the standard size for shaft and key using various design criteria. CO5 Design helical compression and tension spring for specific applications.		

Unit No.	Content	Contact hours	Theory Marks
UNIT-I	BASICS OF MACHINE DESIGN	4	12
	Introduction to machine design, Design consideration, Types of design, Design criteria, Basic requirement of machine elements, Revision types of load and types of stress, Factor of safety, Effect of factor of safety, Factors affecting factor of safety.		

Second Year, Second Semester Diploma Mechanical Engineering

UNIT-II	DESIGN OF PARTS SUBJECTED TO SIMPLE AXIAL LOAD	8	18
	Basic concept of design, Design procedure, Design of machine parts subjected to simple direct load, Such as design of simple screw with axial load, Foundation bolts, Punching and Shearing (Design of column short and long)		
UNIT-III	DESIGN OF JOINTS SUBJECTED TO AXIAL LOAD	12	20
	Basics of joints used for machine elements subjected to direct loads, Design of cotter joints, Pipe joints, Knuckle joints, Turnbuckle joint etc		
UNIT-IV	DESIGN OF PARTS SUBJECTED TO DIRECT SHEAR AND BENDING	10	12
	Basics of parts subjected to direct shear and bending, Design of Riveted joints, Welded joints (fillet, u, lap, butt weld, etc.) simple problems		
UNIT-V	DESIGN OF PARTS SUBJECTED TO TORSION ONLY	12	22
	Basics of parts subjected to Torsion, Design of shaft – Solid-Hollow shaft, Design of key.		
UNIT-VI	DESIGN OF SIMPLE HELICAL SPRINGS	8	12
	Basics of simple helical spring, Types of spring, Application, functions What's factor, Bending and shear stress in spring, Springs of round and square wire section		
UNIT-VII	USES OF STANDARD DATA	6	4
	Selection for standard parts, Factors affecting selection of standard parts, such as nut, bolt and stud. (from Design data Book) of material		
REFERENCES			
1.	Machine Design – R.S. Khurmi		
2.	Machine Design – R.C. Patel		
3.	Machine Design – Shah & Pandya		

 सत्यं शिवं सुन्दरम् Estd. 1949 Accredited Grade "A+" by NAAC	The Maharaja Sayajirao University of Baroda Polytechnic, Department of Mechanical Engineering Near Shastri Bridge, Fatehgunj, Vadodara 390002 Ph: 02652783914-15 email: principal-poly@msubaroda.ac.in		Last Revision 2018-19 Implemented Progressively
	Second Semester Second Year Diploma Mechanical		
Year: II	FLUID MECHANICS (MEC3414)	MARKS	100(P)+50(T.W/VIVA)
Semester: II		HOURS	45(L)+30(P)
Course Outcomes	CO1 Understand fundamental properties, units and fluid behaviour at rest and in motion. CO2 Identify and classify various types of fluid flow and understand their dimensional analysis. CO3 Apply governing equation and laws associated with fluid flow systems. CO4 Analyse the impact of jet on different surfaces & vanes using analytical method. CO5 Understand the concept of Boundary Layer and basics of compressible flow of fluid.		

Second Year, Second Semester Diploma Mechanical Engineering

Unit No	Content	Contact Hours	Theory Marks
Unit-I	FLUIDS AND THEIR PROPERTIES	03	06
	Concepts of Fluid, Fluid Mechanics and Hydraulics, Shear Stress in a moving fluid, Viscosity, Newton's law of viscosity, Types of Viscosity, Causes of viscosity in a liquid and gases, Surface tension, Capillary, Vapor Pressure, Cavitation, Newtonian and non Newtonian fluid, Specific Weight, Specific Volume, Specific Gravity with their units.		
Unit-II	BASICS OF FLUID STATICS	06	13
	Pascal's Law of Pressure at a point Pressure and Head, The Hydrostatic Paradox Hydrostatic Law of Pressure variation with Height (i.e $p = \rho gh$) Total Pressure, Centre of pressure for vertically and inclined immersed surfaces, problems on it. Archimedes's Principle, Buoyancy and Centre of Buoyancy, Meta centre, meta centric Height, Analytical and Experimental method to determine meta centric height Simple numerical based on it.		
Unit-III	FLUID DYNAMICS	05	11
	Introduction, Fluid energy, Types and Interrelation Euler's equation Concept and definition Understanding various terms in Euler's equation and derivation Bernoulli's equation Concept and definition Limitation and assumption Derivation from Euler's equation Application, simple numerical examples based on Bernoulli's equation.		
Unit-IV	FLUID KINEMATICS	07	16
	Introduction Methods of describing Fluid motion Types of fluid flow Steady and unsteady flow Uniform and non-uniform flows Laminar and turbulent flow Compressible and incompressible flow Rotational and irrotational flow One, two, three-dimensional flow Concept of Control Volume Fluid Flow Continuity equation Momentum Equation and its application in Impact of Jet Free and Forced Vertex Flow (Simple numerical of free and forced vertex flow cases) Types of Flow Lines Path Line and Streamline Steak Line or Filament Line, Potential Line or Equipotential Lines Flow net uses of Flow net, Stream Function and its numerical		
Unit-V	IMPACT OF JET	08	18
	Impact of jet on Plane and Curved surfaces, Stationary and moving vanes, Impact of jet on hinged surfaces, Analysis through velocity triangles, Analytical and Graphical solutions.		
Unit-VI	DIMENSIONAL AND MODEL ANALYSIS	07	16
	Dimensional Quantities Fundamental and Derived Units Dimensional Homogeneity Methods of Dimensional Analysis Rayleigh's Method Buckingham's π theorem Methods of selecting repeating variables Advantages of Model Analysis Hydraulic Similarity Types of Forces acting on moving fluids Dimensionless Number Model Laws or Similarity Law		
Unit-	COMPRESSIBLE FLOW OF FLUIDS	03	07

Second Year, Second Semester Diploma Mechanical Engineering

VII	Introduction Basic Thermodynamic Relation and Process Equation of Continuity and Momentum of Compressible Flow Velocity of Sound and its Equation with Derivation Mach Number and its important Mach Wave When body is moving at a subsonic velocity When body is moving at a sonic velocity When body is moving at a supersonic velocity Zone of Action Zone of Silence Mach Cone Area- Velocity relationship		
Unit-VIII	BOUNDARY LAYER Introduction Laminar Boundary Layer Turbulent Boundary Layer Laminar Sub Layer Boundary Layer Thickness Displacement Thickness, Momentum Thickness Energy Thickness Separation of Boundary Layer ,Effect of Pressure Gradient on Boundary Layer Separation	06	13
REFERENCES			
1.	1) Fluid Mechanics by D.S.Kumar		
2.	2) Fluid Mechanics by R.K.Bansal		
3.	3) Fluid Mechanics by R.S.Kurmi		
4.	4) Fluid Mechanics by Yunus A Cengel		
5.	5) Fluid Mechanics by K.L.Kumar		
6.	6) Fluid Mechanics by Domkundwar		

 THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA सत्यं शिवं सुन्दरम् Estd. 1949 Accredited Grade "A+" by NAAC	The Maharaja Sayajirao University of Baroda Polytechnic, Department of Mechanical Engineering Near Shastri Bridge, Fatehgunj, Vadodara 390002 Ph: 02652783914-15 email: principal-poly@msubaroda.ac.in		Last Revision 2018-19 Implemented Progressively
Second Semester Second Year Diploma Mechanical			
Year: II	PRODUCTION TECHNOLOGY – II (MEC3415)	MARKS	100(P)+50(T.W/PRA/ VIVA)
Semester: II		HOURS	60(L)+60(P)
Course Outcomes	CO1	Operate machines tools to develop finished components with safety.	
	CO2	Apply machines adjustment, operation planning for machining processes.	
	CO3	Produce job on specific machine tools for required dimensions and finishing.	
	CO4	Develop tooling for excellent product and extended tool life.	
	CO5	Select Jig and Fixtures for required component geometry and machine tools.	

Unit No.	Content	Contact hours	Theory Marks
UNIT -I	TRANSMISSION OF POWER Belt drive- Velocity ratio, power transmission, types of belt and pulley. Clutches- Jaw clutch and cone clutch. Gear drive: arrangement of Spur gear, bevel gear, worm gear, power transmitted by gears.	02	2
UNIT -II	TURNING-I :- Construction and working of lathe, Principle parts, Head stock, Back Gears, All geared Head stock, Spindle, Carriage, Compound rest, Tool post, Feed shaft, Lead screw, Tail Stock etc. Different types of lathe machines and Attachment used on lathe.	10	18

Second Year, Second Semester Diploma Mechanical Engineering

	Lathe accessories:- Types of chucks, Center plate, Face plate, Mandrels, Lathe centers, Dogs, carries steady rest and rests.		
UNIT -III	TURNING II:-	08	10
	Different Operations which can be carried out on lathe, Rough Turning, finish Turning, Step turning, Facing, Centering, Drilling, Honing, Grooving, etc. Methods of Taper Turning:- Theory and examples, Screw cutting - theory and examples		
UNIT -IV	MILLING:-	05	10
	Construction and working of a universal column and knee type milling machines. Constructions and working of End milling machines, Different operations on milling machines, Milling cutters, Theory and examples on Indexing.		
UNIT -V	DRILLING:-	05	10
	Construction and working of a common drilling machines, Different types of drilling machines different operations on drilling machines, Types and application of drilling		
UNIT -VI	SHAPING AND PLANING:-	06	6
	Construction and working of shaping machines, shaping operations, Quick return motion mechanism, Operation and adjustment, Different types of shaper, Applications, Constructions and working of a Planing machines, Planning operations- Different types of planners, Operations and applications.		
UNIT -VII	TOOL ENGINEERING- I:-	06	16
	Scope, Types of cutting tools, Geometry of cutting tool, Tool signature, Causes of tool failure and Tool wear, Tool life, Taylor’s tool life equation and examples.		
UNIT -VIII	TOOL ENGINEERING–II:-	10	16
	Elements of metal cutting, Theory of chip formations, Orthogonal and oblique cutting, Types of chips, Velocity analysis, Merchants force analysis, Theory and examples.		
UNIT -IX	JIGS AND FIXTURES:-	08	12
	Definitions, Scope, Principles of locations, Design principle, 12 degrees of freedom, Different types of clamps and locations, Important types of Jigs and Fixtures, Advantages, Limitations and applications of jig and fixtures.		
REFERENCES			
1.	Elements of Work Shop Technology Vol-I – Hajra & Chaudhari		
2.	Elements of Work Shop Technology Vol-II - Raghuvanshi		
3.	Production Technology – R.K. Jain		
