

Third Year, First 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	
First Semester Third Year Diploma Mechanical				
Year: III	INDUSTRIAL ENGINEERING– I (MEC3510)	MARKS	100(P)+50(T.W/ VIVA)	
Semester: I		HOURS	60(L)+30(P)	
Course Outcomes	CO1 Study and apply principles of industrial engineering such as time study and method study for improvement of productivity in various area of organization. CO2 Schedule the production activities and machine loading to meet production plan. CO3 Prepare and update the man, machine and material setup cards, process charts for measuring production rate and rating of man power. CO4 Prepare and approve material requisition, records of incoming material to maintain various inventories. CO5 Design of tool equipment, seating and standing position layout by applying ergonomics.			

Unit	Topic	Contact Hours	Theory Marks
1	INTRODUCTION	06	13
	Scope and role of industrial engineering, Productivity, Factors affecting productivity, Various ways and techniques of increasing productivity, Basic work content.		
2	WORKSTUDY	02	04
	Definition and meaning, Role of work study in raising productivity, it's benefits to society, Steps of work study		
3	METHODSTUDY(WORKSIMPLIFICATION)	08	17
	Definition and meaning, Objectives and its basic procedure, Steps of method study, recording techniques, Construction and use of all types of charts and diagrams, Principle of motion economy, Micro motion study.		
4	WORKMEASUREMENTS (TIMESTUDY)	12	16
	Definition and meaning, Objectives and its procedure, Techniques of work measurements, Equipment and formats used, Performance, Rating and leveling, Standard time, Types of allowances, Introduction to other techniques such as activity sampling- P.M.T.S. and M.T.M.		
5	INCENTIVES	08	15
	Introduction, Characteristics of a good incentive schemes, Types of incentive, Wedges incentive schemes with examples (i) Time rate system (ii) Piece rate system (iii) Different piece rate system (iv) Halsey premium bonus scheme (v) Rawan premium bonus scheme.		
6	PRODUCTION, PLANNING AND CONTROL	10	16

Third Year, First Semester Diploma Mechanical Engineering

	Meaning of P.P.C. types of production, their advantages and disadvantages, Functions of P.P.C., Planning, Function such as designing process, planning, order, writing, forecasting, routing, scheduling, dispatching, expediting and follow up. Use and construction of various charts used in P.P.C.		
7	MATERIAL CONTROL Introduction and function of material control (a) Inventory, Function of inventory control, ABC analysis, Introduction of other types of analysis, E.O.Q. and inventory models. (b) Purchasing, system of purchasing (c) Store and store keeping coding system, method of issuing materials, LIFO and FIFO	08	15
8	ERGONOMICS Definition, Importance of ergonomics, Historical Background, Human Machine System, Workspace Design, Work Posture, Ergonomics and Safety	06	04
REFERENCES			
Industrial Engineering & Manufacturing – O.P.Khanna			
Work Study – ILO			
Work Study – R.C.Patel			
Industrial Engineering & Manufacturing – Banga & sharma			
Industrial Engineering and Management- S.B.Patil. AA.Karad. P.B.Kushare			

 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	
First Semester Third Year Diploma Mechanical				
Year: III	PRODUCTION TECHNOLOGY – III (MEC3511)	MARKS	100(P)+50(T.W/ VIVA)	
Semester: I		HOURS	60(L)+30(P)	
Course Outcomes	CO1 Prepare sheet metal blanking and stamping layout and calculate the right tonnage / power of press, inspect and calculate the scrap from individual sheet metal process and suggest improvement for reducing scrap. CO2 Read and verify the foundation erection commissioning activities for different machine tools with requirement of vibration etc.. CO3 Select the gear manufacturing process and non-conventional machining processes according to material type, geometry required and decide the control parameters to achieve accurate, geometry, MRR, surface finish etc. CO4 Select, decide and coordinate the activities for tools and machines to manufacture the machined parts/ components according to capacity of machines for required size, geometry, accuracy, material and quantity of jobs be produced, such that use of conventional machines, semi automat or computer numeric controlled machine.			

Third Year, First Semester Diploma Mechanical Engineering

	CO5 Prepare, verify and implement tool layout or CNC part program as per requirement and verify the geometrical parameters of machine tool and produced jobs for achieving accuracy and precision.
--	--

Unit No.:	Topic	Contact Hours	Theory Marks
1	PRESS WORKING Applications of sheet metal components, Different sheet metal operation, Construction and working of a common press, Classification of presses, Components of the die assembly, Classification of dies, Effects of clearance on size produced, Determination of work done, Tonnage capacity H.P. required to drive the press, Advantages of sheared punch, Blank layout.	10	15
2	GEAR MANUFACTURING Spur gear, Helical gear, Geometry of a spur gear, Tooth, Materials used for manufacturing, Methods used gear manufacture, Introduction to principle methods such as- shaping, milling and other methods, casting, die casting, broaching, blanking, study of gear hobbing.	06	10
3	UNCONVENTIONAL MACHINIG PROCESSES Needs of new technology, Difference between conventional and nonconventional machining processes, Principles, Working, Advantages, Disadvantages and Applications of following processes. EDM, ECM, LBM, USM, AJM, PAM.	08	15
4	FOUNDATION AND ERECTION OF MACHINE TOOLS Function of the foundation, Types of foundation, Factor affecting, Determination of size and dimension of foundation, General procedure for laying a concrete foundation, Use of template, Procedure for erection of a machine grouting.	06	10
5	TESTING OF A MACHINE TOOLS Objectives and testing, Instruments for testing, General test procedure.	06	10
6	AUTOMATES Simple, Semi-automatic and fully automatic lathe machine, Detail study of construction and working of capstan and turret lathe, Tool layout, Single spindle automatic multi spindle automatic, Elementary knowledge of program-controlled machine.	08	14
7	COMPUTER NUMERICAL CONTROL MANUFACTURING (I) Difference between conventional and CNC machines, advantages, Disadvantages and application of the CNC machines. (II) Basics of CNC machines: Brief description of components of CNC machine, detailed knowledge of machine control unit (MCU), Classification of CNC, machines zero, work zero, automatic tool changer, Identification of CNC machine.	06	10
8	FUNDAMENTALS OF PART PROGRAMMING Description of	08	14

Third Year, First Semester Diploma Mechanical Engineering

	Numerical control words, method of listing coordinates, Programming formats. Manual part programming of various operations of drilling machines, lathe, Milling machines Use of CAM software for generating simple part program. Brief explanation of D. N. C (Direct Numerical Control) system its advantages Programmable logic control (P.L.C), their applications		
REFERENCES			
	Production Technology – P.C. Sharma		
	Production Technology – R.C. Patel		
	Workshop Technology Vol-I & II – Hajra & Chaudhari		
	C.N.C Machine – P.S. Pabla & adinathan		
	Automation production system & computer oriented manufacuring by Michell P. Groover		

 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
First Semester Third Year Diploma Mechanical			
Year: III	HYDRAULICS AND HYDRAULIC MACHINERY (MEC3512)	MARKS	100(P)+50(T.W/ VIVA)
Semester: I		HOURS	60(L)+30(P)
Course Outcomes	CO1 Understand, Identify and analyse various losses in the piping system.		
	CO2 Apply flow measurement in various fluid flow systems.		
	CO3 Apply analysis of various performance parameters of hydraulic machines.		
	CO4 Understand the working principle, construction and Operation of various hydraulic machines.		

Unit No.	Content	Contact hours	Theory Marks
I	FLOW OF LIQUID THROUGH ORIFICES AND FLOW OVER NOTCHES AND WEIRS	16	26
	(a)General Introduction to orifices, weirs, notches. (b)Flow through sharp edged orifice, Coefficients of orifice, Large vertical orifice, submerged and partly submerged orifice (c)Time of emptying vessels (uniform and non-uniform sections) through orifice/s. (d) Flow over notches – basic and solution of numerical by direct use of formula		
II	FLOW THROUGH MOUTH-PIECE & PIPES		
	(a)Basic Introduction of Mouth-piece and Pipe, Types of mouth-pieces. (b)Types of losses in flowing liquid (Major and Minor Losses) with proof of expression/s and numerical. (c)Analytical treatment of External and Internal Mouth-pieces-numerical. (d)Fluid Friction, Hydraulic gradient, Total Energy Concept. HGL and TEL with numerical.	14	

Third Year, First Semester Diploma Mechanical Engineering

	(e)Flow through pipes using Darcy Weisbach's and Chezy's equations and numerical (f)Equivalent size of pipe for series /parallel combination and Water Hammer. Siphon and its importance, analytical study and numerical.		24
III	HYDRAULIC TURBINES		
	(a)Classification of hydraulic turbines, construction and working of different types of hydraulic turbines, power and efficiency calculations, Performance by velocity diagrams. (b)Governing of hydraulic turbines and cavitations in reaction turbines	14	26
IV	PUMPS		
	(a)Basic with types of pumps and their industrial applications, Principle, constructional details and working of – R.C.Pump, C.F. Pump, Submersible Pump, Vane Pump etc. (b)Analytical study of C.F.Pumps and R.C.Pumps for performance measurements and study of its characteristics. (c)Hypothetical and Actual Indicator diagrams of R.C.Pump, cavitations and separation, use of air vessels. (d)Problems on C.F. and R.C.Pumps. Priming in C.F.Pumps.	12	18
V	HYDRAULIC MACHINES		
	Construction and working of Hydraulic press, intensifier, accumulator, hydraulic ram as well as other hydraulic machines and numerical on them.	04	06
REFERENCES			
Hydraulics and Hydraulic Machines – R.K. Bansal			
Hydraulics and Hydraulic Machines – D.S. Kumar			
Hydraulics and Hydraulic Machines – R.S. Khurmi			

 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
	First Semester Third Year Diploma Mechanical		
	Year: III	THERMAL ENGINEERING – II (MEC3513)	MARKS
	Semester: I		100(P)+50(T.W/VIVA)
Course Outcomes		HOURS	60(L)+30(P)
	CO1 Demonstrate the construction, working of various Internal Combustion engine and its systems. CO2 Compute the performance parameters of Internal Combustion engine. CO3 Understand the working of steam nozzle and calculate its performance parameters. CO4 Describe the working of different steam condensers and examine its performance. CO5 Identify various features of steam turbine and compute its performance parameters.		

Third Year, First Semester Diploma Mechanical Engineering

Unit No.	Content	Contact hours	Theory Marks
UNIT-I	INTERNAL COMBUSTION ENGINES	12	20
	Introduction, comparison of IC engine and EC engine, Classification of IC engine, Various components of IC engine & its functions, Working of otto two stroke and four stroke cycle engine, Working of diesel two stroke and four stroke cycle engine Comparison between 2-stroke & 4-stroke engine, Comparison between otto and diesel engine, valve timing diagram for 2-stroke and 4- stroke cycle engines		
UNIT-II	SYSTEMS OF I.C. ENGINES	06	10
	Fuel system, Ignition system, Cooling system, Lubrication system, Governing System, starting and stopping system, concept of supercharging		
UNIT-III	TESTING OF I.C.ENGINES	12	20
	Calculation of IP, BP,, FP, mechanical efficiency, thermal efficiency, volumetric efficiency, Relative efficiency, specific fuel consumption, preparation of heat balance sheet, Examples		
UNIT-IV	STEAM CONDENSER	08	13
	Elements of steam condensing plants, Classification of steam condensers, Dalton’s law of partial pressure, Condenser efficiency, Vacuum efficiency and volumetric efficiency, Sources of leakage of air and its effect and remedies for minimizing the air leakage		
UNIT-V	STEAM NOZZLE	12	20
	Shape of nozzles, Friction less adiabatic flow of steam through nozzles, Effect of friction in a nozzle, Critical pressure ratio, Area of cross section of throat and exit for convergent - divergent nozzle for maximum discharge		
UNIT-VI	STEAM TURBINES	10	17
	Components of a steam turbine plant, Principles of working of steam turbine, Types of steam turbines – Impulse, Reaction and Impulse-reaction turbine, Velocity diagram for moving blades, Calculation of axial thrust, Work done and efficiency, Compounding of steam turbine, Governing of steam turbines, Starting and stopping of steam turbine		
REFERENCES			
Thermal Engineering- R. Yadav			
Thermal Engineering – Mathur & Sharma			
Thermal Engineering – N.C. Pandya			
Elements of Heat Engine Vol. I, II & III – R.C.Patel			

 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
First Semester Third Year Diploma Mechanical			
Year: III	PLANT MAINTENANCE AND SAFETY (MEC3514)	MARKS	100(T)+50(T.W/ VIVA)
Semester: I		HOURS	60(L)+30(P)
	CO1 Apply appropriate maintenance practice in mechanical systems.		

Third Year, First Semester Diploma Mechanical Engineering

Course Outcomes	CO2 Identify the reasons of wears and corrosion, apply appropriate technique of its prevention. CO3 Apply recovery and retrofitting methods in breakdown machinery. CO4 Identify faults in machinery by condition monitoring and suggest remedies. CO5 Identify potential hazards in Industry and apply safety precautions to prevent losses of human life and productivity.
------------------------	--

Unit No.	Content	Contact Hours	Theory Marks
UNIT-I	INTRODUCTION TO MAINTENANCE ENGINEERING	04	05
	1.1 Need, Scope & importance of plant maintenance and safety in Industries. 1.2 Need of attitude, knowledge & skill required for shop floor maintenance Tasks in industries. 1.3 Definition and aims of maintenance engineering. 1.4 Primary and secondary functions and responsibilities of maintenance Department. 1.5 Types of maintenance. 1.6 Maintenance cost and its relation with replacement economy. 1.7 Service life of equipment.		
UNIT-II	TRIBOLOGY	04	10
	2.1 Wear: Types, causes and effects. 2.2 Friction and its effect. 2.3 Wear reduction methods. 2.4 Lubricants and Lubrication procedure. 2.5 Bearing types and application.		
UNIT-III	CORROSION AND ITS PREVENTION	04	10
	3.1 Corrosion, factors affecting the corrosion. 3.2 Types of corrosion. 3.3 Corrosion prevention methods.		
UNIT-IV	RECOVERY METHODS FOR THE EQUIPMENT MAINTENANCE	05	10
	4.1 Recovery, methods of recovery. 4.2 Selection of recovery methods. 4.3 Life of Machine tools and equipment.		
UNIT-V	PLANNING AND SCHEDULING OF MAINTENANCE ACTIVITIES	07	10
	5.1 Fault tracing, activities in fault finding. 5.2 Decision tree. 5.3 Sequence of fault finding activities shown as decision tree. 5.4 Draw a decision tree for mechanical and Hydraulic equipments.		
UNIT-VI	BREAKDOWN MAINTENANCE	07	05
	6.1 Types of fault in Machine tools. 6.2 Periodic inspection. 6.3 Degreasing, cleaning and repairing scheme. 6.4 Overhauling of components. 6.5 Repair complexities and its use.		

Third Year, First Semester Diploma Mechanical Engineering

	6.6 Breakdown maintenance-causes, strategies to attend, remedial actions, types of spares to be stored , examples. 6.7 Maintenance of pumps, compressors and D.G. sets.		
UNIT-VII	PREVENTIVE MAINTENANCE	06	10
	7.1 Preventive maintenance. 7.2 Steps and need of preventive maintenance. 7.3 Advantages. 7.4 Two major divisions of activities. 7.5 Frequency cycle. 7.6 Program and schedule of preventive maintenance. 7.7 Repair complexity. 7.8 Typical forms for preventive maintenance. 7.9 Aids to a good preventive maintenance, its type and effect on Preventive maintenance.		
UNIT-VIII	CONDITION MONITORING	03	05
	8.1 Concept, need, scope and applications of condition monitoring.		
UNIT-IX	RECONDITIONING AND RETROFITTING OF MACHINE TOOLS	05	05
	9.1 Reconditioning: advantages, process, features and Fundamental activities. 9.2 Retrofitting: concept, need and application.		
UNIT-X	INDUSTRIAL SAFETY MANAGEMENT	08	15
	10.1 Concept of safety- needs, nature and importance, Concept development as accident prevention, occupational health and environment protection, modern concept of SHE(Safety health and Environment) OR HSE. 10.2 Philosophy of Safety and its scope, Safety terminology. 10.3 Accident causation theories- H W Heinrich’s Ten axioms of Industrial safety, Williams Hadden’s theory. 10.4 Safety psychology, factors affecting work and accidents, Human behaviour, motivation for safety. 10.5 Legislation on Safety and Health. 10.6 Duties of safety inspector, boiler inspector and fire officer.		
UNIT-XI	SAFETY ENGINEERING	07	15
	11.1 Housekeeping, cleaning methods and Concept of Five” “S”, 11.2 Machine Guarding, 11.3 Ventilations and Heat Stress, Purpose and effects, Philosophy of heat regulatory systems 11.4 Lighting (Illuminations) and colors 11.5 Electrical safety. 11.6 Hazards identifications and control-Hazards and progression charts, hazards and Risk analysis. 11.6 Safety in chemical Engineering- Storage hazards and controls.		
REFERENCES			
1.	Maintenance Engineering-- <i>Handbook Higgins & Merrow</i>		
2.	Maintenance Engineering-- <i>H.P.Garg</i>		
3.	Maintenance of Machine Tools-- <i>Gilbirg & Merrow</i>		
4	Pump Handbook -- <i>Karassik, Krutzch, Fraser, M. G.H.</i>		
5	Occupational Safety Management and Engineering-- <i>Willie Flammer</i>		
6	Pump-Hydraulic Compressors-- <i>Audels</i>		
7	Safety and good house keeping-- <i>N.P.C.(Dr.A.N.Saxena)</i>		

Third Year, First Semester Diploma Mechanical Engineering

8	Safety Education-- W. Wayne Worick
9	Factory Act 1948
10	Boiler Act 1951(I.B.R.)
11	Corrosion handbook.

 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	
First Semester Third Year Diploma Mechanical				
Year: III	PROJECT WORK-I (MEC3515L)		MARKS	50
Semester: I			HOURS	30
Course Outcomes	CO1 Conduct survey to identify the problem. CO2 Generate possible solutions to overcome the problem. CO3 Identify the best the alternate solution based on critical parameters and scientific evaluation. CO4 Solution to the problem using designed and decided methodology. CO5 Prepare detailed project report.			

GUIDELINES FOR STUDENTS

- 1) Student's allotment will be based on first come and first serve basis in group of 5-7 students.
- 2) Students have right to select any specific guide but their preference will be considered if guide is available.
- 3) Student should propose the project idea and brief of work to be done in 300 words. and get it approved from guide teacher.
- 4) **Student should record all the activities along with relevant facts and figures, in the logbook.**
- 5) **Students will acquire knowledge beyond curriculum from online/offline course where ever required.**
- 6) **Student shall refer applicable standards, technical magazines and reference / data books.**
- 7) Examination of the project shall be in line with the existing rules of university examination.
- 8) Those groups engaged in industry project, shall submit the photo/ video evidences of work in progress to the guide teacher.
- 9) Standard project report format is mandatory for preparing project report.
- 10) Project set up has to be submitted to college after final project viva and it is not returnable to students.
- 11) Safety and discipline should be maintained during project activity.

CONTENTS OF PROJECT REPORT:

Third Year, First Semester Diploma Mechanical Engineering

1. Title and cover page
2. Declaration
3. Certification of Department and/or Industry sponsored project certificate
4. Acknowledgement
5. Abstract
6. Table of contents
7. List of figures
8. List of tables
9. List of symbols and Abbreviations
10. Introduction
11. Literature review/Problem Survey
12. Alternate solutions from survey.
13. Finding best solution.
14. Body of Project write-up (Chapter wise related to design calculations and other)
15. Design of components/experiment/process.
16. Detailed and assembly drawing of components/planning of experiment.
17. List of manufacturing methods/test kit.
18. Estimation (Approximate)
19. Project planning and execution. (Project-II)
20. Conclusion and Recommendations
21. Future Scope
22. References
