

LIST OF ELCTIVES

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth/Sixth

Sr. No.	Name of Elective	Code
1	Alternate Energy Systems	134MEE1
2	Robotics and Automation	134MEE2
3	Tool Design	134MEE3
4	CAD/CAM	134MEE4
5	Material Handling System	134MEE5
6	Mechatronics	134MEE6
7	Power Plant Engineering	134MEE7

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : Alternate Energy Systems (Elective)
Subject Code : 134MEE1

Teaching Scheme			Paper Hours	Examination Scheme										Total Marks	
L	T	P		Theory		Test	Total		Pract		Oral		Termwork		
				Max	Min		Max	Min	Max	Min	Max	Min	Max		Min
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:

Energy i.e. electrical energy is an important aspect in all sectors of country's development and economy. The energy crisis is mainly caused due to increased population, excess utilization of conventional sources, enhanced living standard and life style of people. The conventional sources of energy are insufficient to meet these demands. Hence, alternative energy sources are utilized for energy generation. The use of alternate energy sources is increasing day by day. The diploma engineers are expected to understand various alternate energy sources and develop, operate and maintain the systems associated with these energy sources. It is also essential to know basics of energy conversion systems, conservation techniques and energy audit.

Objectives:

- To know different types of alternate energy sources.
- To understand basics of energy conversion, conservation and energy audit.
- To understand the applications of non conventional energy sources.

Sr. No.	Details	L	M
Section – I			
1	Introduction to Energy Sources and need for alternative energy sources Major sources of energy: Renewable and Non-renewable. Primary and secondary energy sources. Energy Scenario: Energy Crisis, Energy Supply and Demand – understanding a gap. Climate Change Challenge. Need of Alternate energy sources. Prospects of alternate energy sources.	6	10
2	Solar Energy Applications of Solar energy, Principle of conversion of solar energy into heat and electricity. Solar Radiation: Solar Radiations at earth's surface. Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solar	8	12

	<p>azimuth angle.</p> <p>2.1) Solar thermal technology: Construction and working of typical flat plate collector and solar concentrating collectors and their applications, advantages and limitations. Space heating and cooling. Solar distillation, solar cooking and drying. Solar pumping and Green House.</p> <p>2.2) Solar Photovoltaic technology: Definition of solar PV with its working, PV module, different types of PV modules with efficiencies.</p>		
3	<p>Energy from Biomass</p> <p>Common species recommended for biomass. Methods for obtaining energy from biomass, Thermal classification of biomass a) Gasified, b) Fixed bed and fluidized Application of gasifier, Biodiesel production and application, Agriculture waste as a biomass, Biomass digester, Comparison of Biomass with conventional fuels.</p>	6	12
4	<p>Overview of Geothermal and Ocean Energy.</p> <p>Ocean Thermal Energy Conversion (OTEC), Tidal, and Wave energy.</p>	4	6
Section – II			
5	<p>Wind Energy</p> <p>Basic Principle of wind energy conversion. Power in wind, Available wind power formulation, Power coefficient, Maximum power. Main considerations in selecting a site for wind mills. Advantages and limitations of wind energy conversion. Classification of wind mills. Construction and working of horizontal and vertical axis wind mills, their comparison. Main applications of wind energy for power generation and pumping.</p>	4	10
6	<p>Energy Conservation & Management:</p> <p>Global and Indian energy market, Energy scenario in various sectors and Indian economy, Need and importance of energy conservation and management, Concept of Payback period, Return on investment (ROI), Life cycle cost, Sankey diagrams, specific energy consumption</p>	4	10
7	<p>Energy Conservation Techniques</p> <p>Distribution of energy consumption, Principles of energy conservation, Energy audit, Types of audit, Methods of energy conservation, Cogeneration and its application Combined cycle system, Concept of energy management, Study of different energy management techniques like Analysis of input, Reuse and recycling of waste. Energy education, Conservative technique and energy audit</p>	8	10
8	<p>Economic approach of Energy Conservation</p> <p>Various Energy Conservation techniques, Costing of utilities like steam, compressed air, electricity and water. Ways of improving boiler efficiency, Thermal insulation, Critical thickness of insulation, Waste heat recovery systems, their applications, criteria for installing unit. An introductory approach of energy conservation in compressed air, refrigeration, air conditioning, pumps and Fans.</p>	8	10

Practicals:

1. To demonstrate and measure solar radiation on horizontal surface by using pyranometer.
2. To demonstrate working of solar flat plate water collector.
3. Visit to ICTM to demonstrate working of solar concentrating collector.
4. Visit to ICTM to demonstrate working of solar dryer.
5. Visit to ICTM to demonstrate working of solar assisted refrigeration and air conditioning plant.
6. Visit to IITB to demonstrate working of solar paraboloid concentrating collector,
7. Visit to IITB to demonstrate working of solar still and solar pump.
8. Visit to IITB to demonstrate working of Box type solar cooker and paraboloid concentrating cooker.
9. Visit to IITB to demonstrate working of solar PV power plant used for campus electrification.
10. Visit to biomass plant located in Thane dist.
11. To demonstrate working of wind mill (Mech. Engg. Dept. VJTI).

Text Books:

1. Non conventional energy Resources by. Dr B.H.Khan, Tata McGraw Hill.
2. Solar energy by S. P. Sukhatme Tata McGraw Hill.
3. Solar photovoltaic by C S Solanki, PHI Learning PVT LTD, New Delhi.

Reference book:

Power plant Technology by M.M.El-Wakil, McGraw HILL, International Edition 1984.

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : Robotics &Automation (Elective)
Subject Code : 134MEE2

Teaching & Examination Scheme

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		PR		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:–

The need of today’s manufacturing industrial world is based on best quality & precision oriented shorter manufacturing cycle time. To satisfy this need the use of Robotics & Automation is inevitable.

For each of the sectors of Manufacturing Industry identify some of the stages where an industrial robot may be used

- a) Automotive
- b) Aerospace
- c) Space
- d) Biotechnology
- e) Chemical
- f) Electrical and Electronics
- g) Food and Drink processing

Now a day’s most of the Industry associated with automated plant like computer integrated manufacturing, Flexible Manufacturing System. Hence Students are also expected to work on in a manufacturing context, in association with the downstream applications.

It is therefore necessary to acquaint the students, through lectures and practical to all the above aspects, with best of the software and hardware available.

Objectives:

- To understand concepts of Robotics.
- To understand constructional aspects for robot.
- Application robot in Manufacturing Industry
- To know the various automation process available in Industry.

Syllabus

Sr. No.	Details	L	M
Section-I			
1	ROBOTICS: HISTORY, PRESENT STATUS AND FUTURE /TRENDS <ul style="list-style-type: none"> • Historical Background • Laws of Robotics • Robot Definitions • Robotics Systems and Robot Anatomy • Human Systems and Robotics • Classifications of Robots • Basic robot motions, • Technical features such as - work volume, precision and speed of movement, weight carrying capacity,. 	08	12
2	ROBOT DRIVES AND CONTROL <ul style="list-style-type: none"> • "Functions of Drive Systems • General Types of Fluids • Introduction to Pneumatic Systems • Electrical Drives • Mechanical Drive • Advantages and limitation of various drives 	06	10
3	ROBOT END-EFFECTORS <ul style="list-style-type: none"> • Introduction • Classification of End-effectors • Drive System for Grippers • Mechanical Grippers • Magnetic Grippers • Vacuum Grippers • Adhesive Grippers • Hooks, Scoops and Other Miscellaneous Devices 	06	10
4	Vision and Sensors <ul style="list-style-type: none"> • Need for Sensing Systems • Sensory Devices • Types of Sensors • Robot Vision Systems 	04	08

Section-II			
5	APPLICATIONS OF ROBOTS <ul style="list-style-type: none"> • Introduction • Capabilities of Robot • Robotics Applications • Material Handling, Welding, Assembly, Processing • Advantages and limitations of Robot 	06	10
6	Concept of automation in industry <ul style="list-style-type: none"> • Mechanization and automation, • Classification of automation systems. • Difference between hard automation and robotic automation 	08	10
7	Group Technology <ul style="list-style-type: none"> • Group Technology Define • Part Family, Parts Classification and Coding, • Benefits of Group Technology 	02	06
8	Flexible manufacturing system <ul style="list-style-type: none"> • Introduction, • FMS Components , FMS Layout, FMS equipment, • FMS application, • Introduction to CIM- 	08	14

List of Practical: (Any 6)

1. Demonstration of Cartesian/ cylindrical/ spherical robot.
2. Demonstration of Articulated/ SCARA robot.
3. Virtual modeling for kinematic and dynamic verification any one robotic structure using suitable software.
4. Design and cad drawing of two different types of grippers.
5. Study of sensor integration.
6. Study of robotic system design.
7. Setting robot for any one industrial application after industrial visit.
8. Case study on any one Automated Industry

Books:

Sr. No.	Author	Title	Publisher
01	Groover M.P. & Zimmers	CAD/CAM	Prentice hall of India
02	Groover M.P	Automation, Production systems and Computer Aided Manufacturing	Prentice hall of India
03	R K Rajput	Robotics and Industrial Automation	S Chand New Delhi

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : Tool Design
Subject Code : 134MEE3

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		Pract		Oral		Termwork		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
4	-	2	3	100	35	25	125	50	-	-	25	10	25	10	175

RATIONALE:

On successful completion of this course Tool Design and Drawing, student will gain a confidence to understand and meet the diverse needs of tool room, machining centres repairs / maintenance workshops, marketing, servicing selection and purchase of tools and tooling required by them. Student will be able to work in junior level capacity as a technical assistant or as supervisor in the above areas. He might find the self employment or may proceed for higher studies.

With the advent of change in global manufacturing scenario, innovative approach to fast, accurate, appropriate, flexible and cheap cutting tools / tooling is needed. Curriculum is designed to cover basic and advance aspects of cutting tools. Jigs / Fixtures and press tools in the above context.

The curriculum of the subject is not designed not to cater to the needs of anyone specific type of industry. More stress is given on basic understanding of the concepts. Hence detailed analysis of any component of syllabus is not expected. However attempt is made to cover the overall current and future needs of the above area.

Use of multi media to study and observe different aspects of tools / tooling; to substantiate and correlate class room learning use of Video Camera, Pro-E, I-deas, or similar software subject to availability, is expected to enhance the richness of experience.

Contact with national and international standards organizations like I.S.1., I.S.0. regarding cutting tools / tooling standards update, and with panel of past students of V JTI, now working in relevant area is expected to keep student abreast with current developments. Since they are in the final semester, their contacts will provide potential employers, an opportunity to gauge the students and guide them too.

Similarly Industrial visits, visits to exhibitions, seminars on cutting tools, widening of M.E.S.A. activities, will help students to enrich their experience.

Project Based Learning:

Individual assignment may be allotted to collect the information on current trends in cutting, tools / tooling manufacture, different manufactures, their product range, specifications, applications and limitations which assist in selection of cutting tools / tooling under the given set of conditions, and trends in costing, materials, manufacturing processes etc.

OBJECTIVES:

- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

Syllabus

Part I:- Theory

No.	Contents	L	M
Section - I			
1	Introduction to press working: 1.1 Press working terminology, Basic operations, types of presses-mechanical, hydraulic, pneumatic and their mechanisms, elements of die sets, types of die sets, types of dies simple, compound, progressive, combination and inverted dies, types of punches. 1.2 Methods of reduction of shear force, types of strip layouts, types of strippers, types of pilots, types of stoppers, selection of dowel pins and allen screws. 1.3 Design of blanking die.	10	16
2	Design of Drawing and Bending Dies 2.1 Design of shallow and deep drawing die calculation of blank size by area and graphical method and standard formula, evaluate percentage reduction in each stage ,number of draws, drawing force, blank holding force, press capacity, ironing force. 2.2 Types of Bending dies, developed length calculation, bending force, spring back & methods used to overcome it in a press brake.	7	12
3	Design of Forging Dies 1.1 Design of forging die for multi-impression die-: selection of parting line, drafts, fillet & comer radii, ribs and webs, stock size calculation, flash and gutter. 1.2 design of fullering, edging, blocking, finishing impressions, trimming dies, Die block dimensions, die inserts. Rules for upset forging.	7	12

Section - II			
4	Jigs & Fixture 4.1 Introduction, locating & clamping – principle of location, principle of pin location, locating devices, radial or angular location, V–location , bush location. 4.2 Design principle for location purpose, principle for clamping purposes, clamping devices, design principles common to jigs & fixtures.	10	16
5	Drilling Jigs 5.1 Design principles, drill bushes, design principles for drill bushings. 5.2 Types of drilling jigs – Template jig, plate type jig, open type jig, swinging leaf jig, Box type jig, channel type jig. Jig feet.	7	12
6	Milling Fixtures 1.1 Essential features of a milling fixtures , milling machine vice, 1.2 Design principles for milling fixtures, Indexing jig & fixtures, Automatic clamping devices.	7	12

**Pra
ctic
als:**

1

Types of drill jigs.

2. Milling fixture assembly.
3. Design of die block.
4. Design of broach.

Text Books:

1. Production Engineering by P. C. Sharma (S. Chand Publishers)

Books For Reference:

1. Tool Design by Donaldson
2. An introduction to jigs and tool design by Kempster.
3. Fundamentals of tool design by ASTME
4. Metal cutting theory and cutting tool design by Arshinov MIR Publishers.
5. Techniques of press working sheet metal by Donald F. Earh and Edward A. Reed.
6. Magazines including those online in the relevant topics.
7. Handbooks on the topics as available.
8. Tool Design by P. H. Joshi
9. Press tools by P. H. Joshi

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : CAD CAM (Elective)
Subject Code : 134MEE4

Teaching & Examination Scheme

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		PR		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:–

The need of today’s manufacturing industrial world is based on best quality & precision oriented shorter manufacturing cycle time. To satisfy this need the use of CAD/CAM is inevitable.

The use of computers has transitioned from drafting to modeling. Further CAD usage has evolved from wireframe modeling to feature based modeling on desk tops, integrated with downstream applications like analysis, manufacturing, visualization, etc. Students are expected to work on modeling parts / assembly in a manufacturing context, in association with the downstream applications.

Industry is also extensively using CAD-integrated manufacturing and many CAD packages are attached with CAM packages for generating programs for NC/CNC machines. It is therefore necessary to acquaint the students, through lectures and practical to all the above aspects, with best of the software and hardware available.

Objectives:

- To understand concepts of computer graphics and geometric modeling for effective use of CAD software.
- To understand construction and programming aspects of CNC machines.

Syllabus

Sr. No.	Details	L	M
Section-I			
Computer Aided Design			
1	Introduction to CAD/CAM 1.1 Use of Computers in industrial design and manufacturing 1.2 Product life cycle and CAD/CAM	02	04
2	Computer Aided Design 2.1 The design process, Computers for Design process, concurrent engineering 2.2 CAD Hardware - basic structure, CPU, Memory, I/O devices, Storage devices and system configuration	04	10
3	Computer Graphics 3.1 Scan conversion – Line, circle and 2-D transformations 3.2 Concepts of windowing, clipping, 3-D transformations, hidden surface algorithms	06	10
4	Geometric Modeling 4.1 Requirement of geometric modeling, Types of geometric models, Advantages and disadvantages of 3 types of modeling 4.2 Wireframe Modeling – Mathematical representation, non-parametric, parametric, Analytical entities, synthetic entities- Hermite, Bezier, B-Spline curves 4.3 Surface Modeling – Types of surfaces, analytic and synthetic (No numerical treatment) 4.4 Solid modeling – Geometry and topology, Solid representation schemes- Sweep, B-Rep, CSG, Hybrid, Parametric modeling, feature based modeling 4.5 Graphics standards- IGES, DXF, STEP 4.6 Concept of finite element method	12	16
Section-II			
Computer Aided Manufacturing			
	Introduction to computer numerical Control 5.1 Introduction - NC, CNC, DNC, Basic components of NC, NC procedure, The coordinate system in CNC,		

5	5.2 Motion control system - point to point, straight line, Continuous path (Contouring). 5.3 Advantages and disadvantages of CNC, Application of CNC	08	14
6	Manual Part Programming 6.1 Fundamentals, NC – Words, G codes, M codes, 6.2 Programming format, Selection of cutting parameters like speed, feed etc., Machining center programming, turning center programming, fixed cycles. 6.3 Use of subroutines, macros and do loops	08	12
7	Computer aided Part programming 7.1 Introduction to APT language, geometry, tool motion, postprocessor, auxiliary statements, Macro 7.2 CNC Hardware 7.3 DNC, Adaptive control and Coordinate Measuring Machine 7.4 Introduction to Rapid Prototype manufacturing method	08	14

List of Practicals:

1. Two assignments on CAD for 2D drafting.
2. Two assignments on CAD for 3D Modelling.
3. Manufacturing one turning and one Milling component on CNC.
4. At least four assignments on part programming using subroutines do loops for turning and milling component.
5. Report writing on visit to industry having CNC machine

Books:

Sr. No.	Author	Title	Publisher
01	Groover M.P. &Zimmers	CAD/CAM	Prentice hall of India
02	Groover M.P	Automation, Production systems and Computer Aided Manufacturing	Prentice hall of India
03	P.N.Rao	CAD/CAM	Tata McGraw-Hill,
04	Sareen&Grewal	CAD/CAM	S.Chand Publications
05	by Ibrahim Zeid	CAD/CAM	Tata McGraw-Hill

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : Material Handling System (Elective)
Subject Code : 134MEE5

Teaching & Examination Scheme

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		PR		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:

Material handling equipment is an integral part of modern industrial enterprise. The flow of material in industry depends on a rational choice of the material handling equipment, correct determination of its main parameters and efficient operation.

Every diploma technician must know the operational features of the equipment & its practical application. Carrying parts & products in a shop from one work station to another, transferring them from shop to shop or taking care of stockpiling and reclaiming operations, material handling equipment/systems enable the process to go on without interruptions & at a predetermined pace.

Knowledge of the subject will help technician to understand, select, operate and maintain the material handling equipment.

Objectives:

The student will be able to.

- 1) Understand constructional & operational features of various materials handling systems.
- 2) Identify, compare & select proper material handling equipment for specified applications.
- 3) Know the controls & safety measures incorporated on material handling equipment.
- 4) Understand different material handling processes used in industries.
- 5) Appreciate the role of material handling devices in mechanization & automation of industrial process.

Syllabus

Sr. No	Contents	L	M
Section- I			
1	<p>Introduction to Material Handling System Main types of material handling equipments & their applications, types of load to be handled, types of movements, methods of stacking, loading & unloading systems, principles of material handling systems.</p>	04	06
2	<p>Hoisting Machinery & Equipments 2.1 Construction, working & maintenance of different types of hoists such as lever operated hoist, portable hand chain hoist, differential hoists, worm geared and spur geared hoists, electric & pneumatic hoists, jumfer.</p> <p>2.2 Construction, working & maintenance of different types of cranes such as rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes, floating cranes & cranes traveling on guide rails.</p> <p>2.3 Construction, working & maintenance of elevating equipments such as stackers, industrial lifts, freight elevators, passenger lifts, mast types elevators, vertical skip hoist elevators.</p>	14	08 08
3	<p>Conveying Machinery 3.1 Construction, working & maintenance of traction type conveyors such as belt conveyors, chain conveyors, bucket elevators, escalators.</p> <p>3.2 Construction, working & maintenance of traction less type conveyors such as gravity type conveyors, vibrating & oscillating conveyors, screw conveyors, pneumatic & hydraulic conveyors, hoppers gates & feeders.</p>	06	10
Section- II			
4	<p>Surface Transportation Equipment 4.1 Construction, function, working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV Automatic Guided vehicle, industrial Trailers.</p> <p>4.2 Construction, function, working of cross handling equipment such as winches, capstans, Turntables, Transfer tables, monorail conveyors.</p>	10	12

5	<p>Components of material handling systems</p> <p>5.1 Flexible hoisting appliances such as welded load chains, roller chains, hemp ropes, steel wire ropes, etc</p> <p>5.2 Load handling attachments.</p> <p>a) Various types of hooks-forged, triangular eye hooks,</p> <p>b) Crane grab for unit & piece loads</p> <p>c) Electric lifting magnet, vacuum lifter.</p> <p>d) Grabbing attachment for loose materials</p>	10	12
6	<p>Mechanism used in material handling equipment</p> <p>6.1 Steady state motion, starting & stopping of motion in following mechanisms.</p> <p>- Hoisting mechanism</p> <p>- Lifting Mechanism</p> <p>- Traveling Mechanism</p> <p>- Slewing Mechanism, etc</p>	09	12
7	<p>Selection of material handling equipment</p> <p>Factors affecting choice of material handling equipment such as type of loads, hourly capacity of the unit, direction & length of travel,</p>	03	04
	Total	48	80

Skills to be developed:

Intellectual Skills

- 1- Understand the working principle of equipment/devices.
- 2- Identify & name major component of material handling device.
- 3- Understand role of material handling equipment in the industrial process.
- 4- Understand & appreciate safety instrumentation for equipment

List of Practical:

- 1) Study & demonstration of any one type of conveyor – belt, Screw, pneumatic, hydraulic.
- 2) Study and demonstration of any one type of crane (working model or actual).
- 3) Study and demonstration of fork lift truck (using electric drive or diesel engine) Or hoisting equipment.
- 4) Study of preventive maintenance schedule of any one major material handling equipment using operation manual.

5) Visit to coal handling plant of thermal power plant or cement industry to observe working of different types of bulk material handling devices (at least three equipments). Write report of the visit.

OR

Visit to steel industry or automobile manufacturing unit or sugar industry to observe different types of roller conveyors, Bucket elevators, overhead cranes load handling attachments, electric lifting magnet (at least 3 equipments). Write report of the visit

Books:

Sr. No.	Author	Title	Publisher
01	N. Rundenko	Material handling equipment	Peace Publisher, Moscow
02	M. P. Alexandrov	Material handling equipment	MIR Publisher, Moscow
03	Y. I. Oberman	Material handling	MIR Publisher, Moscow
04	R. B. Chowdary & G. R. N. Tagore	Material handling equipment	Khanna Publisher, Delhi
05	Allegri T. H.	Material handling (Principles & Practice)	CBS Publisher, Delhi
06	Immer J. R.	Material handling	McGraw Hill, New York
07	Parameswaran M. A.	Material handling equipment	C.D.C. in Mechanical Engg., I.I.T., Chennai

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : Mechatronics (Elective)
Subject Code : 134MEE6

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		Pract		Oral		Termwork		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:-

The integration of electronics engineering, electrical engineering, computer technology and control engineering with mechanical engineering is increasingly forming a crucial part in the design, manufacture and maintenance of wide range of engineering products and processes. As a consequence there is a need for diploma engineers to understand systems used in automation

Objectives:

- To understand the applicability of electronic, electrical and computer components in mechanical engineering.

Syllabus

Part I:- Theory

Sr.No.	Details	L	M
Section – I			
1	Introduction to Sensors, Transducers and Actuators Principle, working and applications of-Limit switches, proximity switches like inductive ,capacitive and optical (deflecting and through beam type) , Thumb wheel switches magnetic reed switches ,Optical encoders-displacement measurement,rotary,incremental, opto-couplers. Actuator – solenoids – on-off applications, latching, triggering Types of relays- solid state Types of motors – DC motors, DC brushless motors, AC motors, stepper motors , servo motors	12	20

2	8085 Microprocessor Architecture, Pin configuration, working of microprocessor, and applications. Introduction to ICs used for interfacing such as – Programmable peripheral devices , USART, memory, keyboard, display – LCD,LED,I/O device, ADC, DAC etc	12	20
Section - II			
3	Programmable Logic Controller (PLC) Introduction, PLC definition, PLC block diagram, Difference between relay panel and PLC, ,power supply, input/output modules (analog, digital) concepts of sink/source, set/reset, latch/unlatch, advantages and disadvantages, installation , troubleshooting and maintenance	9	15
4	Selection of a PLC Programming equipment, Programming formats Ladder diagrams and sequence listing, large process ladder diagram construction, flowcharting as a programming method , Basic PLC functions Register basics, timer functions, counter functions Intermediate functions – Arithmetic functions, number comparison and number conversion functions Data handling functions- SKIP, Master control relay, Jump, Move, Block move, Table to register and register to table move functions. FIFO and LIFO functions, File Arithmetic and Logic function	9	15
5	Advanced PLC functions and their applications PLC digital bit functions and applications Sequencer functions and cascading of sequencers PLC matrix functions Discrete and analog operation of PLC, Networking of PLCs. PLC auxiliary commands and functions,	6	10

Part II:-Practicals

List Of Practical:

Term work shall consist of detailed report on the following experiments :

1. Identification and demonstration of different sensors and actuators.
2. Demonstration of the working of various digital to analog and analog to digital converters.
3. Development of ladder diagram, using PLC for motor start and stop by using two different sensors
4. Trace, interpret and demonstrate working of at least two electro pneumatic systems.
5. Trace, interpret and demonstrate working of at least two electro hydraulic systems.

Text Books

1. Electronic control systems in Mechanical and Electrical Engineering ,Bolton W.Mechatronics- Pearson Education Ltd. Tenth Reprint,1989
2. Introduction to Mechatronics and Measurement systems Istand B.H. and Alciatore D.G. Tata McGraw Hill Publishing, ,Second Edition
3. Programmable Logic Controllers ,John W. Webband Ronald Reis ,Prentice Hall of India, 4th Edition

References Books:-

1. Programmable Logic Controllers ,John W. Webband Ronald Reis ,Prentice Hall of India, 4th Edition 1980

Course Name : Diploma in Mechanical Engineering
Course Code : DME
Semester : Fifth / Sixth
Subject Title : Power Plant Engineering (Elective)
Subject Code : 134MEE7

Teaching Scheme			Paper Hours	Examination Scheme										Total Marks	
L	T	P		Theory		Test	Total		Pract		Oral		Term work		
				Max	Min		Max	Min	Max	Min	Max	Min	Max		Min
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

The student is introduced to various aspects of automobile engineering at this stage. The subject gives him an opportunity to get some basic knowledge on different aspects construction and working of automobiles. The practical exercise to the student about the different theoretical topics which are studied at length during the course gives them more understanding about the topic.

Objectives:

- To understand basics of energy conversion.
- To understand the working of various power plants and various systems used in them.

COURSE CONTENT:

THEORY		L	M
SECTION - I			
1	Introduction to power plant	6	10
1.1	Power scenario in India		
1.2	Types of power plants –Hydro, Nuclear, Thermal,		
1.3	Future trends in power sector Analysis of steam cycles, Carnot, Rankine, Reheat cycle, Regenerative cycle, Methods of reheating, adv and dis adv of reheat cycle Gas turbine cycle		
2	Steam power plant	10	18
2.1	Layout of steam power plant, general features of selection of site		
2.2	High pressure boilers- construction and working of subcritical and supercritical boilers		
2.3	Coal and ash handling systems. Equipments for in plant handling of coal such as belt conveyor, screw conveyor, bucket elevator. Coal crushing, pulverized fuel handling systems. Ball mill, pulverized fuel burner. Hydraulic & pneumatic ash handling. Electrostatic precipitator		
2.4	Boiler feed water treatment		
2.5	Environmental aspects of steam power plant, water pollution, emission standard & its control		

3.0	Nuclear power plant	8	12
3.1	Fusion & fission reaction, general criteria for selection of site		
3.2	Elements of nuclear power station layout, types of nuclear reactors		
3.3	Nuclear fuels, coolant & moderators		
3.4	Working of PWR, BWR, CANDU, BREEDER, type reactors		
3.5	Safety precautions & waste disposal		
SECTION II			
4.0	Gas turbine plant	4	10
4.1	Components of gas turbine power plants, gas turbine fuels		
4.2	Comparison of gas turbine plant with diesel and steam power plant		
4.3	Environmental impact of gas turbine power plant		
5.0	Waste heat recovery	6	10
5.1	Sources of waste heat		
5.2	Heat recovery forms & methods- sensible & latent heat recovery		
5.3	Use of waste heat- Agricultural, green house, Animal shelter, Aqua cultural uses,		
5.4	process heating Waste heat recovery boilers		
6	Non conventional Power generation	8	10
6.1	Geothermal plant, types, economical justification		
6.2	Tidal power plant, factors affecting suitability of site, working of different tidal		
6.3	power plants, adv& dis adv		
6.4	Wind power plant, different types, adv& dis adv		
6.5	Solar power plant		
6.6	Magneto hydro dynamic power plant		
6.7	Small hydro power plant Introduction to plasma technology		
7.0	Economics & operation research	6	10
7.1	Prediction of load, selection of types of generation, number of generating units.		
7.2	Load duration curves, cost analysis, elements controlling the cost of power plant(simple numerical).		
7.3	Major electrical equipments in power station, generator, step up transformer, switch gear, electrical motors.		

PRACTICALS

1. Visit to steam power plants/nuclear power plants /wind power plants /hydro power powerplants & prepare a report.
2. Collect information & technical details of nuclear power plants.
3. Collect information & technical details of steam power plant.
4. Collect information & technical details of solar & wind power plants.
5. Study of economic & operational aspects of power plants(simple numerical).
6. Assignments on coal & ash handling systems.
7. Assignments on heat recovery systems.

Text Books

1. A course in PPE – Arora & Domkundwar
Dhanpat Rai publications, 1st edition 1998
- Ref:-1. PP Technology by M M E Wakil – McGraw Hill international edition-1984
2. P.K.Nag; PPE Tata McGraw Hill-2006