

Mechanical Engineering Draft Syllabus for 4th Semester

Name of the Course : Mechanical Engineering					
Subject: THERMAL ENGINEERING - II					
Course code: ME			Semester : Forth		
Duration : 17 weeks			Maximum Marks : 150		
Teaching Scheme			Examination Scheme:		
Theory : 3 hrs/week			Internal Assessment: 20 Marks		
Tutorial: hrs/week			Teacher's Assessment (Assignment & Quiz): 10 Marks		
Practical : 2 hrs/week			End Semester Exam: 70 Marks		
Credit: 4			Practical: Internal Sessional continuous evaluation: 25 Marks		
			Practical: External Sessional examination: 25 marks		
Aim :-					
S. No.					
1	To study the Boilers and their application in different process industries.				
2	To study the Steam Power Cycles and their application in actual power generation.				
3	To study the Steam Condensers and their application in actual power generation.				
4	To study the Air Compressors and their application in different process industries.				
5	To understand the fundamentals of Refrigeration and Air-Conditioning.				
Objective :-					
S. No.	The Students should be able to:				
1.	<ul style="list-style-type: none">Explain construction & working principle of different Boilers and their different Mountings and Accessories.				
2.	<ul style="list-style-type: none">Understand the Steam Power Cycles and their application in actual power generation.				
3.	<ul style="list-style-type: none">Explain construction & working principle of different Steam Condensers and their utility in actual power generation.				
4.	<ul style="list-style-type: none">Select appropriate type and calculate performance parameters of Air Compressors to suit the requirements.				
5.	<ul style="list-style-type: none">Explain Refrigeration and Air-Conditioning Processes and their application.				
Pre-Requisite: Elementary knowledge on Physics, basic Mathematics and Thermal Engineering-I					
Contents			Hrs/week		
THERMAL ENGINEERING- I					
Chapter		Name of the Topic		Hours	Marks
		GROUP-A			
1	1.0	BOILERS (STEAM GENERATOR)		09	
	1.1	Classification of Boilers.			
	1.2	Fire Tube & Water Tube Boilers with example, working principle, difference, applications.			
	1.3	Construction & working principle of Cochran, Babcock and Wilcox and La-Mont Boilers.			
	1.4	Definition of Boiler Mountings and Accessories, important names of Boiler Mountings and Accessories and their functions.			

	1.5 1.6 1.7 1.8	Basic conception and comparison of Stoker fired, Fluidized Bed and Pulverised Fuel Boilers. Boiler Performance (Simple numerical on Boiler Performance). Boiler Draught, Classification and comparison of boiler draught and Calculation of chimney heights (Simple numerical related to chimney heights calculation) Necessity of boiler feed water treatment. Modern high pressure boiler & its characteristics.		
2	2.0.0 2.1.0 2.1.1 2.1.2 2.1.3 2.2.0 2.2.1 2.2.2 2.3.0 2.3.1 2.3.2 2.3.3 2.3.4	STEAM POWER CYCLES Reversible Cycle. Carnot Gas Power Cycle and Carnot Vapour Power Cycle with representation of the same on P-V & T-S diagrams. Deduction of Thermal Efficiency of Carnot Power Cycle (Simple numerical on Carnot Power Cycle with steam). Impracticability of Carnot Cycle in actual cases. Rankine Cycle with & without feed pump work and representation of the same on P-V, T-S & H-S diagrams. Comparison between Carnot and Rankine Cycles. Definition of Thermal Efficiency, Work Ratio and Specific Steam Consumption. Basic Principle, representation on P-V, T-S & H-S diagrams, labelled schematic flow diagram and utility of the following cycles: (No numerical) Modified Rankine Cycle. Simple Reheat Cycle. Simple Regenerative Cycle. Actual Reheat-Regenerative Cycle.	10	
3	3.0 3.1.0 3.1.1 3.1.2 3.1.3 3.1.4 3.2.0 3.2.1	STEAM CONDENSER Working Principle, Purpose of using and Classification of Steam Condensers. Comparison between Surface Condenser and Jet Condenser. Dalton's Law Of Partial Pressure as applicable to Condenser. Definition of Condenser Vacuum, Vacuum Efficiency and Condenser Efficiency. (No numerical) Sources of air leakage in Steam Condenser. Working Principle, Purpose of using and Classification (Natural Draught and Mechanical Draught) of Cooling Towers. Labelled schematic flow diagram of Cooling Water Circulation of a Surface Condenser with and without Cooling Tower.	08	
GROUP-B				
4	4.0.0 4.1.0 4.1.1	AIR COMPRESSOR Uses of Compressed Air Working Principle and Classification of Air Compressors.	08	

	4.1.2	Definition of Compression Ratio, Compressor Capacity, Free Air Delivery and Swept volume.		
	4.2.0	Reciprocating air compressor		
	4.2.1	Construction and Working Principle of Single Stage and Two Stage Compressor.		
	4.2.2	Volumetric Efficiency, Isothermal Efficiency & Mechanical Efficiency. (Simple numerical on single stage compressor)		
	4.2.3	Advantages of Multi Staging.		
	4.3.0	Rotary Compressor		
	4.3.1	Construction and Working Principle of Screw, Lobe, Vane and Centrifugal Compressors. (No numerical)		
	4.3.2	Comparison and Applications of Reciprocating and Rotary Compressors.		
	4.4.0	Purification of Air to remove Oil, Moisture and Dust.		
	4.5.0	Methods of energy saving in Air Compressors.		
5	5.0	REFRIGERATION & AIR CONDITIONING	10	
	5.1.0	Definition of Refrigeration, Tonne of Refrigeration (Unit of Refrigeration) and Coefficient of Performance (COP) of Refrigerator & Heat Pump.		
	5.1.1	Refrigerant, desirable properties of a refrigerant and common commercial refrigerants & their suitability of use.		
	5.1.2	Air Refrigeration: Basic Principle, representation on P-V & T-S diagrams, labelled schematic flow diagram Bell Coleman Cycle (Reversed Joule Cycle). (Simple numerical)		
	5.1.3	Vapour Compression Refrigeration: Basic Principle, representation on P-V, P-H & T-S diagrams, labelled schematic flow diagram and function of components of Ideal Vapour Compression Refrigeration Cycle. (No numerical)		
	5.1.4	Application of Refrigeration System: Water Cooler, Refrigerator, Ice Plant and Cold Storage. (Labelled schematic lay-out only)		
	5.2.0	Basic concept of Psychrometry including the following: Dry air & Moist air, Saturated air & Unsaturated air. Dry-bulb temperature, Wet-bulb temperature, Dew-point temperature and Psychrometer. Relative Humidity, Specific Humidity and Degree of saturation. Partial Pressure of Air & Vapour and Enthalpy of Moist Air. Psychrometric Chart. (No numerical)		
	5.3.0	Definition of Air-Conditioning and classification of Air-Conditioning Systems.		
	5.4.0	Schematic lay-out and representation on Psychrometric Chart of the following Air-Conditioning Processes. Sensible heating and cooling.		

		Humidification and dehumidification. Humidification with heating and cooling. Dehumidification with heating and cooling. Mixing of two air streams. (No numerical)		
Sub Total:			45	
Internal Assessment Examination & Preparation of Semester Examination			6	
Total			51	

Practical:

Skills to be developed:

Intellectual Skill :

1. Understand working principle and construction of Boilers and their application.
2. Understand basic concept of Steam Power Cycles.
3. Understand working principle of Steam Condensers and cooling Tower.
4. Understand working principle of Reciprocating and Rotary Compressor.
5. Interpret Psychrometric Chart.
6. Understand different Refrigeration Cycle and Air-Conditioning Processes.

Motor Skills :

1. Collect and write technical specification of Steam Boiler.
2. Collect and write technical specification of Cooling Tower.
3. Report on visit to Steam Power Plant.
4. Conduct trial on single stage, single cylinder reciprocating compressor.
5. Conduct trial on Refrigeration Test Rig for calculation of COP, power required and refrigeration effect.

List of Practical:

1. Study of Boiler and Boiler Parts. (Both Fire Tube and Water Tube Boilers)
2. Study of Boiler Mountings and Accessories.
3. Study and compare between Surface Condenser and Jet Condenser.
4. Trace the cooling water circulation of a surface condenser with cooling tower.
5. Study of schematic layout of Steam Power Plant.
6. Study of single stage, single cylinder reciprocating compressor.
7. Collection and analysis of Manufacturer's Catalogue for Reciprocating / Rotary Compressor.
8. Study of Refrigeration Unit / Air- Conditioning Unit. (Refrigerator / Window Air-Conditioner)
9. Trial on Refrigeration Test Rig for calculation of COP, power required and refrigeration effect.

Note: At least **FIVE (05)** nos. of Practical / Study are to be conducted.

Text Books			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
Domkundwar V. M.	A Course in Thermal Engineering.		Dhanpat Rai & Co.
Dr. D.S.Kumar	Engineering Thermodynamics (Principles & Practices)		S.K. Kataria & Sons
P. L. Ballaney	A Course in Thermal Engineering.		Khanna Publishers
R. S. Khurmi	A text book of Thermal Engineering.		S. Chand & co. Ltd.
R. K. Rajput	A Course in Thermal Engineering.		Laxmi Publication, Delhi
Patel and Karmchandani	Heat Engine Vol. - I & II		Acharya Publication

P. K. Nag	Engineering Thermodynamics		Tata McGraw Hill
B. K. Sarkar	Thermal Engineering		Tata McGraw Hill
A.R. Basu	Thermal Engineering (Heat Power)		Dhanpat Rai & Co.

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments / Tutorial :-

- Simple numerical on Carnot Power Cycle with steam.
- Draw labelled schematic flow diagram and write function of components of the following Steam Power Cycles:
 - Simple Reheat Cycle.
 - Simple Regenerative Cycle.
 - Actual Reheat-Regenerative Cycle.
- Show on Psychrometric Chart the following Air-Conditioning Processes:
 - Sensible heating and cooling.
 - Humidification and dehumidification.
 - Humidification with heating and cooling.
 - Dehumidification with heating and cooling.
- Draw labelled schematic flow diagram of air in Multistage Air Compressor.

EXAMINATION SCHEME: END SEMESTER EXAMINATION

GROUP	MODULE OR CHAPTER	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2,3	12	ANY 20	1	20	6	FIVE, (AT LEAST TWO FROM EACH GROUP)	10	50
B	4,5	8				4			

EXAMINATION SCHEME FOR PRACTICAL SESSIONAL

Internal Examination: Examiner- Lecturer in Mechanical Engg. / Jr. Lecturer			
Five No. of Experiments / Study attended & respective lab note submitted in due time.	5 x 3 = 15		
VIVA VOCE	10		
TOTAL	25		
External Examination: Examiner- Lecturer in Mechanical Engg. / Jr. Lecturer			
Submission of Signed Lab Note Book (for five experiments / study)	5 x 2 = 10		
On spot experiment / study (one for each group consisting 15 students / explanation or study item)	10		
VIVA VOCE	5		
TOTAL	25		

Production Process

Name of the Course :Diploma in Mechanical Engineering	
Subject Title: Production Processes	
Course code: ME/	Semester : Fourth
Duration : 17 Weeks	Maximum Marks : 200
Teaching Scheme	Examination Scheme
Theory : 3 hrs/week	Internal Assessment Examination: 20 Marks
Tutorial: hrs/week	Teacher's Assessment(Assignment & Quiz): 10 Marks
Practical : 4 hrs/week	End Semester Exam.: 70 Marks
Credit: 5	Practical: Internal Sessional continuous evaluation: 50 Marks
	Practical: External Sessional Examination:50 Marks
Aim :-	
S.No	
1	To provide education at diploma level in aspects of production process technology which are of relevance to scientists, engineers and other professions who operate in the manufacturing and automobile industry and related sectors, particularly in the production, process and development areas.
2	To study various types of basic production processes. To select, operate and control the appropriate processes for specific applications and production processes, surface finishing processes and plastic processes.
Objective :-	
S No	The student will able to
1	<input type="checkbox"/> Use the basic machine tools like lathe, drilling and milling, shaper machine.
2	<input type="checkbox"/> .Understand the importance of surface finish and related surface finishing methods
3	<input type="checkbox"/> Understand and select plastic molding processes
Pre-Requisite:-	
S.No	
1	Knowledge of basic manufacturing processes.

Contents		Hrs/week	
Chapter	Name of the Topic	Hours	Marks
01	Turning 1.0 Kinematic system working principle & application of centre Lathe, 1.1 Taper turning methods & angle calculation of taper turning , Problems on taper turning 1.2 Thread cutting mechanism & calculation of change gears for thread cutting operation & simple problems 1.3 Cutting parameters & machining time calculation	09	
02	Shaping & planning: 2.0 Kinematic system, working principle & application of Shaping machine 2.1 Application of shaper & planner machine 2.2 Specification of shaper machine, Different operations like making of flat surface, vertical surface, inclined surface, Slotting, pocketing, T-slot cutting, Vee-block & formed surface (grooving & straight tooth cutting for spur gear) 2.3 Cutting tools, Cutting parameters& machining time calculations.	06	
03	Drilling 3.0 Kinematic system, working principle & application of Drilling machine, 3.1 Twist drill nomenclature., deep hole drilling 3.2 Cutting parameters, machining time calculation,.	03	
04	Milling and gear cutting 4.0 Kinematic system, working principle & application of Milling machine, 4.1 Milling operations – side and face milling, straddle milling, form milling, gang milling, end milling, face milling, T- slot milling, slitting. 4.2 Cutting parameters & machining time calculation for plain milling operation 4.3 Gear cutting on milling machine –Dividing head and Indexing methods 4.4 Gear hobbing: Principle of operation, Advantages And limitations. Hobbing techniques – climb and conventional, 4.5 Gear shaping - Principle of operation, advantages, disadvantages, 4.6 Gear finishing processes – Gear shaving , Gear grinding, Gear burnishing, gear lapping	10	

05	Grinding 5.1 Classification of machines , abrasive types & uses 5.2 Grinding wheel composition (Bond, grade ,grit & structure), types and shapes, Designation of a grinding wheel (specification) 5.3 Types of Grinding operations, Factors selecting of grinding wheel 5.4 Balancing, truing & dressing.	08	
06	Super Finishing Processes 6.1 Necessity of super finishing process & application 6.2 Honing, Lapping, Burnishing. Buffing & polishing	03	
07	Plastic Moulding 7.1 Type of plastic & application of plastic moulding 7.2 Compression moulding, transfer moulding, injection moulding, blow moulding, vacuum forming, extrusion, calendaring, rotational moulding	06	
	Total	45	

Practical:

Note: One hour of the practical per week is to be utilized for instructions by subject teacher to explain & demonstrate the accessories, tool holding & work holding devices as mentioned in practical contents. The student will write assignments based on these sessions.

Skills to be developed:

Intellectual skills:

1. know the significance of various methods of taper turning, milling & gear cutting.
3. Calculate machining time for different operations.
4. Identify cutting tool nomenclature / marking systems.
5. Know the significance of various super finishing methods.
6. Understand the different processes of gear cutting.
7. Understand various plastic molding methods.

Motor Skills:

1. Operate lathe, drilling, shaping and milling machines.
3. Operate grinding machine.
4. Use the indexing mechanism.

List of Practical:

- 1) Study of shaper & Planner machine & Identify different parts, drives, clapper box, crank & slotted mechanism, feed mechanism, adjustment of length & position of stroke, work holding devices, tool holding devices, tools used, setting of tool & work also Operate shaper machine without work
- 2) Study attachment & accessories and Practice on making a job involving lathe operations like taper turning & thread cutting & use of measuring instruments (batch of 10 students per job)
- 3) Study of Milling machine & identify different parts, drives, cutter holding devices, milling cutters, dividing head & operate milling machine without work
- 4) Practice on making a job involving Shaper machine with the operations like a) surface planning b) slot making c) angular machining [For example a V block] (batch of 15 students per job)
- 5) Practice of milling machine on making a spur gear of given module
- 6) Practice on making welding of flat position & vertical position, MIG & TIG welding practice on 4mm thick plate spot & seam welding (batch of 10 students per job)
- 7) Study of different moulding process, tools & equipments used, types of sands, preparation of sand & making a green sand mould
- 8) Practice on making a job involving pattern shop & use of measuring instruments (batch of 15 students per job)
- 9) Study of grinding machine & identify different parts, drives, wheel mounting process & practice one job containing surface grinding / cylindrical grinding with closed tolerances (for the job already made on shaper & lathe machine)
- .10) one assignment each on tool nomenclature of single point cutting tool, twist drill & Milling cutter

.NOTE

- a) Sl.No. 1, 3 & 10 are compulsory
 - b) From the rest 4 tasks have to be completed
- Examination Schedule (Internal practical sessional)

Name of Authors	Titles of the Book	Edition	Name of the Publisher
S. K. Hajra Chaudary, Bose, Roy	Elements of workshop Technology – Volume I & II		Media Promoters and Publishers limited
O. P. Khanna and Lal	Production Technology - Volume I & II		Dhanpat Rai Publications.
W.A.J. Chapman, S.J. Martin	Workshop Technology - Volume I , II & III		Viva Books (p) Ltd.
O.P. Khanna	A text book of Foundry Tech.		Dhanpat Rai Publications.
R.B. Gupta	Production Technology		Satya Prakashan New Delhi
H.S. Bawa	Workshop Technology Volume-I& II		Tata McGraw-Hill
John A. Schey	Introduction to Manufacturing Processes		McGraw-Hill
M. Adithan A. B. Gupta	Manufacturing Technology		New age International
Pabla B. S. M. Adithan	CNC machines		New age international limited.
B. L. Juneja	Fundamental of metal cutting and machine tools		New age international limited.
Steve Krar, Albert Check	Technology of Machine Tools.		McGraw-Hill International
P. N. Rao	CAD/CAM Principals and Applications		Tata McGraw-Hill
P. N. Rao	Manufacturing Technology Metal Cutting & Machine tools		Tata McGraw-Hill
Girling	All about Machine Tools		
Reference books :- Nil			
Suggested List of Laboratory Experiments :- Nil			
Suggested List of Assignments/Tutorial :-			
1. Schematic diagram of a centre lathe showing Kinematic System And Working Principle Of Lathes			
2. Kinematic diagram & Working Principle Of milling machine			
3. Kinematic diagram And Working Principle Of shaper & planer			
4. Kinematic diagram And Working Principle Of radial drilling machine			
5. use of various attachment used in lathe, milling machine, shaper & drilling machine			

Examination Schedule: External practical Sessional examination			
Examiner: Lecturer in Mechanical Engineering & Foreman (Work Shop).			
For Making job (4 task) & submitting signed job sheet in scheduled time		4X2.5 = 10	
On spot job		20	
viva voce on study		20	
		50	

Examination Schedule Internal practical Sessional:

Making job (4 task) & submitting job sheet in scheduled time		4X5 = 20	
Viva - voce		4X2.5 = 10	
Attending classes for studying different machines and submitting respective assignment		3X4 = 12	
Viva voce & skill in operating machine		8	
Total:		50	

End Semester EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2,3	08	ANY 20	1	20	4	FIVE	10	50
B	4,5	06				4	(AT LEAST ONE FROM EACH GROUP)		
C	6,7	06				2			

Principles of Electrical Engineering

Name of the Course: Diploma in Mechanical Engineering			
Subject Title: Principles of Electrical Engineering			
Course Code: ME/		Semester: Fourth	
Duration: one Semester (17 Weeks)		Maximum Marks: 150	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		Internal Assessment Examination:20 Marks	
Tutorial: 0 hrs./week		Teacher’s Assessment(Assignment & Quiz): 10 Marks	
Practical: 2 hrs./week		End Semester Exam.: 70 Marks	
		Practical: Internal Sessional continuous evaluation:25 Marks	
Credit: 4		Practical: External Sessional Examination:25 Marks	
Aim:			
Sl. No.			
1.	The general aim of the subject is to provide technical skills, technical awareness and the ability to analyse, develop, and manage different systems in the field of electrical engineering in a comprehensive way.		
Objective:			
Sl. No.	The students will be able to:		
1.	Identify the generation, transmission & distribution system		
2.	Identify different types of Transducers & sensors and their applications		
3.	Identify different types of measuring instruments and their applications		
4.	Identify different types of generators, motors, transformers and their Industrial applications		
5.	With information regarding electrical hazards, Fire, safety & protections, and realistic work scenarios, the student shall be able to identify and describe electrical hazards and precautions that should be taken to avoid injury in the workplace. Concept of electrical earthing.		
6.	Knowledge of electrical energy management – tariff system, cost of energy, energy conservation and energy audit.		
Pre-Requisite:			
Sl. No.			
1.	Knowledge of ELECTRICAL TECHNOLOGY as taught in the second semester.		
Contents (Theory)		Hrs./Unit	Marks
Unit: 1	Introduction to Electrical power 1.1 Energy Sources – Conventional and non conventional. 1.2 Generation of Conventional Electrical Power 1.3 Transmission of Electrical Power- Transmission voltage, Transmission system. (only fundamental) 1.4 Distribution of Electrical Power –different types, system & level of Electrical Power Distribution in brief. 1.5 Three phase supply: star and delta circuit, Line and phase current and	04	05

	voltage relation, expression of three phase power, simple problems on above basic relationship.		
Unit: 2	Basic transducers & sensors 2.1 Introduction, different types with examples. 2.2 Some common types of Transducer & sensor element (Basic working principle and common application area) – strain gauge, load cell, proximity sensor (inductive and capacitive), flow rate sensor, LVDT, Piezoelectric sensor, Heat and smoke detector.	05	10
Unit: 3	Measuring Instruments: 3.1 Introduction- Operating principles of PMMC and Moving Iron instruments (No mathematical deduction needed). Use of above instruments as ammeter and voltmeter. (No problems, only concept) 3.2 Basic Idea on operating principles of digital multimeter, Clip on meter, Megger, Speedometer, Tachometer, (No mathematical deduction needed). Applications.	05	10
Unit: 4	DC Machines 4.1. Construction and principle of operation of DC Motor, concept of back e.m.f. and torque Equations (no deduction), Simple Problems and Type of DC motors. 4.2. identification of different parts of DC machines with their functions 4.5 D.C motor Starter, Types, Necessity , Rating & specifications 4.5 Speed torque characteristics of DC Motor. 4.6 Speed control of DC motor (methods only) 4.6 Specifications, ratings and Industrial applications of different types of DC motors.	08	15
Unit: 5	A. C .Machines 5.1 Transformer: 5.1.1 Single phase transformer: Construction, and principle of operation, types. EMF equation and transformation ratio. Various losses (only names and concept), efficiency and regulation (only equation or relations - no deduction). Simple Problems. 5.1.2 Auto transformer (concept only), Applications. 5.1.3 Three phase transformer – Basic idea about construction, identification of some constructional parts, accessories and their function (e.g. conservator, breather, buchholz relay, bushings etc.). 5.1.3 Specification, rating and Applications of 1ph & 3ph transformers (with concept of power and distribution transformer). 5.2 Induction motor: 5.2.1 Types, Construction and principle of operation of 3 phase squirrel cage induction motor. Concept of slip, Expression of torque (no deduction), Speed torque characteristics, speed control (methods only), concept of VFD control, reversal of rotation, 5.2.2 Starters-Types, Specification and rating. 5.2.3 Industrial Application of both sq cage and slip ring induction	15	15

	<p>motor.</p> <p>5.2.4 Single phase induction motor, universal motor, stepper motor & servo motor (concept only). Applications of these motors in various fields.</p> <p>5.3 Synchronous Machine:</p> <p>5.3.1 Construction, principle of operation of Alternator.</p> <p>5.3.2 Synchronous Motor- principle of operation, methods of starting & applications.</p>		
Unit 6	<p>Electric hazards, safety, Protections and Earthing</p> <p>6.1 Electric Shock, Effects of Electrical Current On the Human Body, Electrical Emergencies- actions to be taken when an electrical emergency arises.</p> <p>6.2 Fire – Different types of Fire, their causes, Fire Extinguishers, different types of fire extinguishers and their applications.</p> <p>6.3 Earthing – Necessity of earthing, types of earthing (name only), Earth resistance values, Eventualities in case of failure of earthing, Common electricity rules regarding earthing (related to electrical installation of lighting & machines only).</p>	07	10
Unit 7	<p>Electric Energy Management</p> <p>7.1 Tariff structure for different types of consumers, examples related to state electricity board/CESC or any other similar organization.</p> <p>7.2 Power factor improvement (methods only)</p> <p>7.3 Energy conservation – Energy conservation Act, energy efficiency, BEE Star Rating.</p> <p>7.4 Energy Audit – Concept only.</p>	04	05
Total		48	70
Contents (Practical)			
Sl. No.	Skills to be developed		
1.	<p>Intellectual Skills: i) Identify electrical Instrument & equipment observing nameplate & various symbols.</p> <p>ii) Identify safety and precautionary measure to be taken before performing experiments.</p> <p>iii) Interpret wiring diagrams for various applications.</p> <p>iv) Decide the procedure for setting experiments.</p>		
2.	<p>Motor skills: i) Draw wiring diagram and make connections to connect electrical equipments and instruments.</p> <p>ii) Follow the proper procedure observing the necessary safety and take necessary reading from different instruments.</p> <p>iii) Record all the information specifications, rating of the instrument & equipment and also observations and result in tabular form properly.</p> <p>iv) Make comments on observation and result using graph, Chart, Phasor diagram etc. as applicable.</p> <p>v) Writing the Laboratory report in presentable way.</p>		

List of Laboratory Experiments:	
Sl. No.	A. List of Practical:
1.	Know your Electrical engineering Laboratory. Make list of machines, instruments, tools etc. with specification and types.
2.	For a given resistive & inductive series & parallel circuit, select ammeter, voltmeter & wattmeter. Make the connections and measure current, voltage, power factor and power drawn by the circuit. Measure it by clip on meter & compare it.
3.	For a given DC Shunt/Series motor, select suitable meters, make connections as per diagram, check the connections and run the motor. Take the meter readings to draw speed torque characteristics. Make suitable changes in the connections to reverse the direction of rotation.
4.	For a given DC shunt motor prepare a circuit to control its speed above & below normal, plot its graph.
6.	List specifications of given single phase transformer. Perform no load test on the transformer to find transformation ratio.
7.	Measure Insulation resistance of an existing Electrical lighting installation.
8.	Connect an energy meter to a single phase load, take reading & prepare energy consumption bill with present tariff structure of WBDCL / CESC / other recognized organization.
	B) Field work:
9.	Observe Electric wiring of main building / a block / workshop in your campus list the accessories used and draw a general layout (single line diagram).
10.	Observe earthing of your laboratory, measure its resistance & list its significance
	C) Mini project: (any one)
11.	Prepare a simple electric wiring circuit comprising of 2 lamps, 2 sockets, 1 fan with a fuse & check it.
12.	Prepare trouble-shooting chart of an Induction / a DC motor to identify the common faults of the motor.
13.	Prepare a list and fix the location for proper fire extinguisher and label the Escape route in case of fire in your classroom/ any Laboratory. Also put in writing other necessary information in proper location. (using standard symbols)

Text Books

Sl No.	Name of Authors	Titles of the Book	Name of Publisher
1.	E.Huges	Electrical Technology	ELBS
2.	H. Cotton	Electrical Technology	Pitman
3.	B.L.Thereja	Electrical Technology Vol –I to IV	S.Chand
4.	S.K.Bhattacharya	Electrical Machines	Tata McGrow Hill
5.	A.K.Sawhney	A Course in Electrical & Electronics Measurement & Instrumentation	Dhanpat Rai & Sons

EXAMINATION SCHEME (THEORITICAL)

GR O UP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				GRO UP	UNIT	SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS			TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 6,7	6	TWENTY	ONE	1 X 20 = 20	B	1,6,7	THREE	FIVE, TAKING AT LEAST ONE FROM EACH GROUP	TEN	10 X 5 = 50
	2,3	4				C	2,3	THREE			
	4,5	10				D	4,5	FIVE			

EXAMINATION SCHEME (SESSIONAL)

- Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Third Semester. **Distribution of marks: Performance of Job – 10 Marks (equally distributed on total no. Of possible experiment), Notebook – 10 Marks (also equally distributed on total no. Of possible experiment). Mini Project – 5 Marks.**
- External Assessment of 25 marks** shall be held at the end of the Third Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

Computer Programming

Name of the Course : Diploma in Mechanical Engineering	
Subject Title: Computer Programming	
Course code: ME/	Semester : Fourth
Duration : 17 weeks	Maximum Marks : 50
Teaching Scheme:	Examination Scheme
Theory : 1 hrs/week	Mid Semester Exam: Marks
Tutorial: hrs/week	Assignment & Quiz: Marks:
Practical : 2 hrs/week	End Semester Exam: Marks
Credit: 2	Practical: Internal Sessional continuous evaluation: 25 Marks
	Practical: External Sessional Examination: 25 Marks
Aim :-	
S.No	
1	
Objective :- To understand how to give instructions to computers. To expose a student to the basic principles of programming through a structured programming language like 'C'. To enable the students to learn about any advanced Object Oriented programming Language.	
S No	The student will able to
1	Break a given task into subtasks.
2	Enhance logical thinking.
3	Develop 'C' programs for simple applications.
Pre-Requisite:-	
S.No	
1	Sound knowledge of computer.

Contents		Hrs/week
Chapter	<i>Name of the Topic</i>	Hours
01	Problem, definition and analysis, algorithm, flow charts, tracing and dry running of algorithms. Introduction to 'C' programming, simple program using Turbo 'C' compiler and execution of 'C' program	02
02	C Fundamentals: Character set, constants, data types, identifiers, key words, variable declarations, Types of Operators – unary, binary, arithmetic, relational, logical, assignment. Hierarchy of operators, expressions, library functions, Use of input/ output functions viz. Printf(), Scanf(), getch(), putch()	03
03	Use of Control Statements:- if-else, if-else-if, switch-case, while loop, do – while loop, for loop, break and continue. Writing, Compiling, Executing and debugging programs	05
04	Introduction to Subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and writing	03
05	Concept of String, string input / output functions Defining and accessing a user defined functions, Passing of arguments, declaration of function prototypes Storage classes: automatic, external, static variables	03
	Total	16

Practical:

Skills to be developed:

Intellectual Skills:

- Prepare and interpret flow chart of a given problem.
- Represent data in various forms.
- Use various control statements and functions

Motor Skills:

- Write program in 'C' language.
- Run and debug 'C' program successfully.

LIST OF PRACTICALS

To write simple programme having engineering application involving following statements

1. Use of Sequential structure: atleast **two** problems
2. Use of if-else, if-else-if statements: atleast **five** problems
3. Use of for statement: atleast **eight** problems
4. Use of Do-While Statement: atleast **two** problems
5. Use of While statement: atleast **five** problems
6. Use of break and Continue statement: atleast **two** problems
7. Use of multiple branching Switch statement: atleast **two** problems
8. Use of different format specifiers using Scanf() and Printf(): atleast **two** problems
9. Use of one dimensional array e.g. String, finding standard deviation of a group data: atleast **five** problems
10. Use of two dimensional array of integers/ reals: atleast **two** problems
11. Defining a function and calling it in the main: atleast **five** problems

Examination Schedule Internal practical Sessional:

Attending classes, practicing programs & submitting respective assignment in time		20	
Viva - voce		5	
Total:		25	
Examination Schedule: External practical Sessional examination			
Examiner: Lecturer			
For submission of assignment in scheduled time		10	
On spot program		10	
viva voce		05	
Total		25	

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Reference books :- Nil	
Suggested List of Laboratory Experiments :- Nil	
Suggested List of Assignments/Tutorial :- as mentioned in list of practical	

List of Books:

Author	Title	Publication
Yashwant Kanitkar	Let us 'C'	BPB publications
Balguruswamy	Programming in 'C'	Tata Mc- Graw Hill
Pradip Dey & Manas Ghosh	Programming in 'C'	Oxford Higher Education
Byron Gotfried	Introduction to 'C' programming	Tata McGraw Hill
Denis Ritchie and Kernighan	Introduction to 'C' programming	Prentice Hall Publications

Theory of Machines and Mechanism

Name of the Course : Diploma in Mechanical Engineering	
Subject Title: Theory of Machines and Mechanism	
Course code: ME/	Semester : Fourth
Duration : 17 weeks	Maximum Marks : 150
Teaching Scheme:	Examination Scheme:
Theory : 3 hrs/week	Internal Assessment: 20 Marks
Tutorial: hrs/week	Teacher's assessment (Assignment & Quiz): 10 Marks

Practical : 2 hrs/week		End Semester Exam: 70 Marks	
Credit: 4		Practical: Internal Sessional continuous evaluation:25 Marks	
		Practical: External Sessional Examination:25 Marks	
Aim :-			
S.No			
1	To focus on understanding the concept of machines, mechanisms and their elements. Also study kinematics aspects of various links in mechanisms.		
S No	The student will able to		
1	Know different machine elements and mechanisms.		
2	Understand Kinematics and Dynamics of different machines and mechanisms.		
3	Select Suitable Drives and Mechanisms for a particular application.		
	Appreciate concept of balancing and Vibration.		
	Develop ability to come up with innovative ideas		
Pre-Requisite:-			
S.No			
		Contents	Hrs/week
Chapter	Name of the Topic		Hours
01	Fundamentals and types of Mechanisms and velocity in Mechanism: 1.1 Kinematics of Machines: - Definition of Statics, Dynamics, Kinematics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, machine and structure, inversion of mechanism. 1.2 Inversions of Kinematic Chain: 1.2.1 Inversion of four bar chain- four bar chain mechanism, coupled wheels of Locomotive & Pantograph.		10

	<p>1.2.2 Inversion of Single Slider Crank chain- Slider Crank mechanism, Rotary I.C. Engines mechanism, Whitworth quick - return mechanism, Crank, Slotted lever quick return mechanism, hand- pump.</p> <p>1.2.3 Inversion of double slider crank chain- double slider crank mechanism, Scotch Yoke mechanism & Oldham's coupling</p> <p>1.3 Velocity of a point in mechanism:</p> <p>Determining the velocity of a point in 4-bar chain mechanism & slider- Crank mechanism by relative velocity method and instantaneous centre method (use graphical method only).</p>	
02	<p>Cams and Followers:</p> <p>2.1 Concept, definition and application of Cams and Followers.</p> <p>2.2 Classification of Cams and Followers.</p> <p>2.3 Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation.</p> <p>2.4 Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method).</p>	06
03	<p>Power Transmission:</p> <p>3.1 Types of Drives – Belt, Chain, Rope, Gear drives & their comparison.</p> <p>3.2 Belt Drives - flat belt, V– belt & its applications, material for flat and V-belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission(Simple numerical on flat belt drive)</p> <p>3.3 Gear Drives – Spur gear terminology, types of gears and gear trains, their selection for different application, train value & Velocity ratio for compound, reverted and simple epicyclic gear train, methods of lubrication, Law of gearing. (simple problems on gear train)</p>	08
04	<p>Flywheel and Governors:</p> <p>4.1 Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine</p> <p>(no Numericals). Coefficient of fluctuation of energy, coefficient of fluctuation</p>	08

	<p>of speed and its significance.(simple problems on determination of mass of fly wheel using crank effort diagram)</p> <p>4.2 Governors - Types, concept, function and application & Terminology of Governors. (simple problems on watt & porter governor)</p> <p>4.3 Comparison between Flywheel and Governor.</p>	
05	<p>Brakes, Dynamometers, Clutches & Bearings:</p> <p>5.1 Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer.</p> <p>5.2 Construction and working of i) shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake.</p> <p>5.3 Concept of Self Locking & Self energizing brakes.</p> <p>5.4 Numerical problems to find braking force and braking torque for shoe & band brake.</p> <p>5.5 Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer.</p> <p>5.6 Clutches- Uniform pressure and Uniform Wear theories.</p> <p>5.7 Function of Clutch and its application, Construction and working of i) Single plate clutch, ii) Multiplate clutch, iii) Centrifugal Clutch iv) Cone clutch v) Diaphragm clutch. (Simple numerical on single and Multiplate clutch).</p> <p>5.8 Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot.</p> <p>Torque & power lost in friction (no derivation). Simple numerical.</p>	10
	<p>Balancing & Vibrations:</p> <p>6.1 Concept of balancing. Balancing of single rotating mass. Graphical method for balancing of several masses revolving in same plane & different plane.</p> <p>6.2 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.</p>	03
	Total	45

Practical:

Skills to be developed:

Intellectual Skills:

1. Understand working of different mechanism.
2. Determine velocity of link in a given mechanism.
3. Analyse balancing of rotating masses in a single plane.
4. Interpret interrelationship between components of various braking mechanisms.
5. Understand concepts of vibrations in various machineries, their harmful effects and remedies.
6. Compare various power transmission devices.

Motor Skills:

1. Drawing of velocity diagrams of four bar mechanism & slider crank mechanism.
2. Assembly and dismantling of brakes and clutches.
3. Drawing of cam profiles from a given data for i. C. Engine.
4. Drawing of velocity diagram.

LIST OF PRACTICALS**List of Practical:**

- 1) Find the ratio of time of cutting stroke to the time of return stroke for quick return mechanism of a shaper machine.
- 2) Sketch & describe working of Oldham's coupling.
- 3) Determination of velocity by relative velocity method (four problems) (use graphical method).
- 4) Determination of velocity by instantaneous centre method (four problems) (use graphical method).
- 5) Draw the profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (At least six problems)
- 6) Determine the radius of rotation of fly ball (porter governor) for different speed of governor and draw a graph between radius of rotation versus speed.

- 7) Dismantling and assembly of mechanically operated braking mechanism for two wheelers.
- 8) Determination of power transmitted by any belt drive using any one dynamometer.
- 9) Dismantling and assembly of multiplate clutch of two-wheeler.
- 10) Determine graphically balancing of several masses rotating in a single plane/ several planes (use graphical method – 4 problems).
- 11) Numerical problems to find braking force and braking torque for shoe & band brake.
- 12) Determine torque & power lost in friction for i) Simple Pivot, ii) Collar Bearing & iii) Conical pivot.
- 13) Determine of mass of fly wheel using crank effort diagram.

Examination Schedule Internal practical Sessional:

Attending classes, practicing problems & submitting respective assignment in time		20	
Viva – voce		5	
Total:		25	

Examination Schedule: External practical Sessional examination

Examiner: **Lecturer**

For submission of assignment in scheduled time		15	
viva voce		10	
Total		25	

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- as mentioned in list of practical

List of Books:

Author	Title	Publication
Khurmi & Gupta	Theory of machines	S. Chand & Co
S. S. Rattan	Theory of Machine	McGraw Hill companies
P.L. Ballaney	Theory of machines	Khanna Publication
Dr. R. K. Bansal Dr. J.S. Brar	Theory of machines	Laxmi Publications
V.P. Singh	Theory of machines	Dhanpat Rai & Co
TimoShenko & Young	Theory of machines	Wiley Eastern
Jagdishlal	Theory of machines	Bombay Metro – Politan book ltd.
Ghosh - Mallik	Theory of machines	Affiliated East west press
Beven T	. Theory of machines	CBS Publication
J.E.Shigley	Theory of machines	Mc Graw Hill
Abdulla sharif	Theory of machines	Dhanpat Rai & Co

Professional Practices-II

Name of the Course : Mechanical Engineering	
Subject Title: Professional Practices-II	
Course code: ME/	Semester : Fourth
Duration :	Maximum Marks : 50
Teaching Scheme	Examination Scheme
Theory : hrs/week	Mid Semester Exam: Marks
Tutorial: hrs/week	Assignment & Quiz: Marks
Practical : 3 hrs/week	End Semester Exam: Marks
Credit: 2	Practical: Internal Sessional continuous evaluation: 25 Marks
	Practical: External Sessional Examination: 25 Marks

Aim :-		
S.No		
1	To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.	
Objective :-		
S No	The student will able to	
1	<input type="checkbox"/> Acquire information from different sources.	
2	<input type="checkbox"/> Prepare notes for given topic.	
3	<input type="checkbox"/> Present given topic in a seminar.	
4	<input type="checkbox"/> Interact with peers to share thoughts.	
5	<input type="checkbox"/> Prepare a report on industrial visit, expert lecture	
Pre-Requisite:-Nil		
Contents		Hrs/week
Chapter	Name of the Topic	
01	Industrial Visits	
	Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. ONE industrial visits may be arranged in the following areas / industries : The industrial visits may be arranged in the following areas / industries : Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant . vi) Machine shop having CNC machines. vii) State Transport workshop / Auto service station viii) City water supply pumping station ix) Manufacturing unit to observe finishing and super finishing processes	

02	<p>Information Search :</p> <p>Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic.</p> <p>Following topics are suggested :</p> <ul style="list-style-type: none"> v) Engine lubricants & additives vi) Automotive gaskets and sealants vii) Engine coolants and additives viii) Two and Four wheeler carburetor. ix) Power steering x) Filters xi) Different drives/Transmission systems in two wheelers. xii) Types of bearings – applications and suppliers. xiii) Heat Exchangers xiv) Maintenance procedure for solar equipment. <p>Tools holder on general purpose machines and drilling machines.</p>	
03	<p>Mini Project / Activities : (any one)</p> <ul style="list-style-type: none"> a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as : i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers b) Dismantling of assembly (e.g. jig / fixtures , tool post , valves etc.) Take measurement and prepare drawings / sketches of different parts. c) Make a small decorative water fountain unit. d) Toy making with simple operating mechanisms. 	
04	<p>Using any CADD related software following topics are to be practiced</p> <ul style="list-style-type: none"> • Common 2D command for drawing simple sketch:- Line, Circle, Rectangle, arc, Ellipse, Move, Copy, Trim, Fillet, Chamfer , Extend, offset, Array break etc. • Generation of 3 D model: 3D operation: Extrude, Pocket, shaft, 	

	<p>Groove, Hole, Slot, Stiffener, Chamfer, Draft, Shell; Boolean Operations: Add, Remove, Intersection, Union trim; Transformation features: Translation, Rotation, Symmetry; Dimensioning of 3 D model, Generation of BOM, Generation of 3 D sheet metal/wireframe model and its development.</p> <ul style="list-style-type: none"> Transformation from 3D model to Front View, Side view, Top View, various type of sectional view such as offset section, Aligned section view, details, clippings, broken view, Dimensioning of respective view; Inserting frame and Title Block. <p>Practice on following 3 D drawing: rigid flange coupling, knuckle joint, tray, bracket, cylinder-cylinder intersection model.</p>	
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Text Books

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Robert M. Thomas	Advanced AutoCAD		Sybex BPD
R Cheryl	Beginning AutoCAD 2011-Exercise Book (W/2 DVDs)		BPB Publication
D Raker & H.Rice	Inside Autocad		BPB Publication
P.Radhakrishnan,S.Subramaniyan & V.Raju	CAD/CAM/CIM		New Age International Publication
Sham Tickoo	Autocad 2002 with Applications		Tata Mcgraw Hill
George Omura	Mastering Autocad 2010 & Autocad LT 2010		
David Frey	AutoCAD 2007 and AutoCAD LT 2007: No Experience Required		

Reference books :- Nil

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Suggested List of Laboratory Experiments :- Nil

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Suggested List of Assignments/Tutorial :- Nil	

Internal Practical Sessional Examination		
Chapter	Topic	
1	Submission of project Report on industrial visit by scheduled date	5
2 & 3	submission of assignment & project report by scheduled date	5
4	Practice of CADD software	10
	Viva - voce	5
	Total:	25
External Practical Sessional Examination		
Examiner: Lecturer/ Jr. Lecturer		
	Submission of signed report & assignment	5
	On spot CADD Drawing	15
	Viva voce	5
	Total:	25