

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	Basic conception and comparison of Stoker fired, Fluidized Bed		

	1.6	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)		
	1.7	Necessity of boiler feed water treatment.		
	1.8	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 4.1.2	AIR COMPRESSOR Uses of Compressed Air Working Principle and Classification of Air Compressors. Definition of Compression Ratio, Compressor Capacity, Free Air	08	

	<p>4.2.0 Delivery and Swept volume. Reciprocating air compressor</p> <p>4.2.1 Construction and Working Principle of Single Stage and Two Stage Compressor.</p> <p>4.2.2 Volumetric Efficiency, Isothermal Efficiency & Mechanical Efficiency. (Simple numerical on single stage compressor)</p> <p>4.2.3 Advantages of Multi Staging.</p> <p>4.3.0 Rotary Compressor</p> <p>4.3.1 Construction and Working Principle of Screw, Lobe, Vane and Centrifugal Compressors. (No numerical)</p> <p>4.3.2 Comparison and Applications of Reciprocating and Rotary Compressors.</p> <p>4.4.0 Purification of Air to remove Oil, Moisture and Dust.</p> <p>4.5.0 Methods of energy saving in Air Compressors.</p>		
5	<p>5.0 REFRIGERATION & AIR CONDITIONING</p> <p>5.1.0 Definition of Refrigeration, Tonne of Refrigeration (Unit of Refrigeration) and Coefficient of Performance (COP) of Refrigerator & Heat Pump.</p> <p>5.1.1 Refrigerant, desirable properties of a refrigerant and common commercial refrigerants & their suitability of use.</p> <p>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)</p> <p>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)</p> <p>5.1.4 Application of Refrigeration System: Water Cooler, Refrigerator, Ice Plant and Cold Storage. (Labelled schematic lay-out only)</p> <p>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)</p> <p>5.3.0 Definition of Air-Conditioning and classification of Air-Conditioning Systems.</p> <p>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 &</p>	10	

	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 :-
<ol style="list-style-type: none"> 1. Simple numerical on Carnot Power Cycle with steam. 2. Draw labelled schematic flow diagram and write function of components of the following Steam Power Cycles: <ul style="list-style-type: none"> • Simple Reheat Cycle. • Simple Regenerative Cycle. • Actual Reheat-Regenerative Cycle. 3. Show on Psychrometric Chart the following Air-Conditioning Processes: <ul style="list-style-type: none"> • Sensible heating and cooling. • Humidification and dehumidification. • Humidification with heating and cooling. • Dehumidification with heating and cooling. 4. 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		
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Name of the Course :Diploma in Mechanical Engineering			
Subject Title: Manufacturing Process II			
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 :-			
Sr. 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	• Use the basic machine tools like lathe, drilling and milling, shaper machine.		
2	• .Understand the importance of surface finish and related surface finishing methods		
3	• Understand and select plastic molding processes		
Pre-Requisite:-			
S.No			
1	Knowledge of basic manufacturing processes.		
Contents			
Chapter	Name of the Topic	Hrs/week	
		Hours	Marks
01	Turning 1.0 Kinematic structure 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 structure , working principle & application of Shaping machine 2.1 Application of 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	
	Drilling		

03	3.0 Kinematic structure , 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 structure , 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,	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), Factors selecting of grinding wheel 5.3 Types of Grinding operations: Cylindrical, Surface & Centre less grinding 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) Identify, use, specification of different pattern tools, machines & measuring instruments used in pattern shop. And making simple pattern (solid pattern & split pattern having core print & core box one each) (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	Manufacruting Technology Metal Cutting & Machne 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 lath 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 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	

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	

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	08	20	1	20	4	FIVE (AT LEAST ONE FROM EACH GROUP)	10	50
B	3,4	06				3			
C	5,6,7	06				3			



West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

Name of the Course: Diploma in Mechanical Engineering			
Subject Title: Elements 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 voltage relation, expression of three phase power, simple problems on above basic relationship.	04	05
Unit: 2	Basic transducers & sensors 2.1 Introduction, different types with examples. 2.2 Some common types of Transducer & sensor element (Basic working	05	10

	principle and common application area) – strain gauge, load cell, proximity sensor (inductive and capacitive), flow rate sensor, LVDT, Piezoelectric sensor, Heat and smoke detector.		
Unit: 3	<p>Measuring Instruments:</p> <p>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)</p> <p>3.2 Basic Idea on operating principles of digital multimeter, Clip on meter, Megger, Speedometer, Tachometer, (No mathematical deduction needed). Applications.</p>	05	10
Unit: 4	<p>DC Machines</p> <p>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.</p> <p>4.2. identification of different parts of DC machines with their functions</p> <p>4.5 D.C motor Starter, Types, Necessity , Rating & specifications</p> <p>4.5 Speed torque characteristics of DC Motor.</p> <p>4.6 Speed control of DC motor (methods only)</p> <p>4.6 Specifications, ratings and Industrial applications of different types of DC motors.</p>	08	15
Unit: 5	<p>A. C .Machines</p> <p>5.1 Transformer:</p> <p>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.</p> <p>5.1.2 Auto transformer (concept only), Applications.</p> <p>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.).</p> <p>5.1.3 Specification, rating and Applications of 1ph & 3ph transformers (with concept of power and distribution transformer).</p> <p>5.2 Induction motor:</p> <p>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,</p> <p>5.2.2 Starters-Types, Specification and rating.</p> <p>5.2.3 Industrial Application of both sq cage and slip ring induction 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>	15	15

Unit 6	Electric hazards, safety, Protections and Earthing 6.1 Electric Shock, Effects of Electrical Current On the Human Body , Electrical Emergencies- actions to be taken when an electrical emergency arises. 6.2 Fire – Different types of Fire, their causes, Fire Extinguishers, different types of fire extinguishers and their applications. 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).	07	10
Unit 7	Electric Energy Management 7.1 Tariff structure for different types of consumers, examples related to state electricity board/CESC or any other similar organization. 7.2 Power factor improvement (methods only) 7.3 Energy conservation – Energy conservation Act, energy efficiency, BEE Star Rating. 7.4 Energy Audit – Concept only.	04	05
Total		48	70
Contents (Practical)			
Sl. No.	Skills to be developed		
1.	Intellectual Skills: i) Identify electrical Instrument & equipment observing nameplate & various symbols. ii) Identify safety and precautionary measure to be taken before performing experiments. iii) Interpret wiring diagrams for various applications. iv) Decide the procedure for setting experiments.		
2.	Motor skills: i) Draw wiring diagram and make connections to connect electrical equipments and instruments. ii) Follow the proper procedure observing the necessary safety and take necessary reading from different instruments. iii) Record all the information specifications, rating of the instrument & equipment and also observations and result in tabular form properly. iv) Make comments on observation and result using graph, Chart, Phasor diagram etc. as applicable. v) Writing the Laboratory report in presentable way.		
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 McGraw Hill
5.	A.K.Sawhney	A Course in Electrical & Electronics Measurement & Instrumentation	Dhanpat Rai & Sons

EXAMINATION SCHEME (THEORITICAL)

GR O U P	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				GR O U P	UNIT	SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS			TO BE SET	<u>TO BE ANSWERED</u>	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)

1. **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.**
2. **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.**



West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

Name of the Course : Diploma in Mechanical Engineering		
Subject Title: Engineering Metrology		
Course code: ME/	Semester : Fourth	
Duration : 17 weeks	Maximum Marks : 100	
Examination Scheme:		
Teaching Scheme:	Internal Assessment: 10 Marks	
Theory : 2 hrs/week	Teacher's assessment (Assignment & Quiz): 05 Marks	
Tutorial: hrs/week	End Semester Exam: 35 Marks	
Practical : 2 hrs/week	Practical: Internal Sessional continuous evaluation: 25 Marks	
Credit: 3	Practical: External Sessional Examination: 25 Marks	
Aim :-		
S.No		
1	<p>The mechanical Engineering technician often come across measuring different parameters of machined components and the appropriate fittment of interchangeable components in the assemblies. For the above purpose the student is also required to analyze the quantitative determination of physical magnitude.</p> <p>During previous semesters different systems of measurement and their units etc have been introduced in the different subjects. The different methods and instruments which can be used for linear and angular measurements, geometrical parameters (like surface finish, Squareness, Parallelism, Roundness etc ..) and the use of gauges and system of limits, Fits, Tolerances etc. are often required to be dealt in detail by diploma technician on the shop floor. The student is also required to analyze, Interpret and present the data collected for ensuring the quality.</p> <p>The knowledge of the subject also forms the basis for the design of mechanical measurements systems, design & drawing of mechanical components.</p>	
S No	The student will able to	
	<ol style="list-style-type: none"> 1. Select appropriate instrument/s for specific measurement. 2. Measure Physical quantity 3. Measure & adjust errors of measurement 4. Design & use of gauge system in manufacturing industry 5. Analyze and interpret the data obtained from the different measurements processes 	
Pre-Requisite:-		
S.No		
1	Unit system & basic physics	
Contents		
Chapter	<i>Name of the Topic</i>	Hrs/week
Group A		
01	Limits, Fits ,Tolerances and Gauges Tolerances, Selective Assembly, Interchangeability, Limits Of Size, Allowances, Clearances, Interference, IS 919- 1993 , Fits, Selection Of Fits, Numerical Problems On Limits Of Size And Tolerances, , Taylor's Principle, Gauge Design, hole and shaft basis system, Plain Plug Gauge IS: 3484 -1966, Plain Ring Gauge IS: 3485 -1972, Snap Gauge IS: 3477 -1973.	05
02	Linear Measurement	04

	Description, working principle, method of reading, least count for Vernier Calipers, Micrometers(outside micrometer, Inside Micrometer, Stick Micrometers), depth gauge & Height Gauge, Feeler gauge, Slip Gauges (category, use, Selection of Slip Gauges for setting particular dimension)	
03	Angular Measurement Concept, Instruments for Angular Measurements, construction, Working principle and Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges).	03
04	Comparators Definition, Classification, use of comparators, Working principle of different type of comparators like mechanical comparator (Dial indicator, Sigma comparator), Pneumatic comparator, Electrical Comparators, Optical Comparators, characteristics of good comparator, Relative advantages and disadvantages.	04
Group B		
05	Screw thread Measurements Terminology of thread, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch & thread angle, Working principle of floating carriage dial micrometer, Screw Thread Micrometer, pitch measuring m/c, Two wire method, thread gauge (plug gauge, ring gauge & snap gauge)	04
	Gear Measurement and Testing Analytical and functional inspection, Rolling test, Measurement of tooth thickness (constant chord method), gear tooth Vernier, Errors in gears such as backlash, runout, composite.	03
	Measurement of surface finish Primary and secondary texture, Sampling length, Lay, terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, Working principle of stylus probe type instruments.	03
	Machine tool testing Parallelism by dial indicator, Straightness testing by straight edge, spirit level & Autocollimators, flatness testing by dial gauge, level or Autocollimators, optical flats Squareness Testing - by dial indicator, optical square, indicating method., alignment testing of lathe machine tool as per IS standard procedure.	04
	Total	30

Practical:

Skills to be developed:

Intellectual Skills:

1. To understand principle, working of various measuring instruments.
2. Selection of proper instruments for measurement.
3. Calculation of least count of instrument.
4. Take reading using the instrument
5. Interpret the observation and results

Motor Skills:

1. Setting the instruments for zero error adjustment.
2. Proper alignment of the instrument with work piece
3. Handling of instruments

4. Care and maintenance of instruments.
5. Measure the dimensions form the instruments.
6. Calibration and traceability of the instruments
7. Graphical representation of data.

LIST OF PRACTICALS

List of Practical: (Any five)

1. Standard use of basic measuring instruments. Surface plate, v-block, sprit level, combination set, filler gauge, screw pitch gauge, radius gauge, vernier caliper, micrometer and slip gauges to measure dimension of given jobs.
2. To find unknown angle of component using sine bar and slip gauges.
3. Study and use of optical flat for flatness testing.
4. Measurement of screw thread elements by using screw thread micrometer, screw pitch gauge.
5. Study and use of dial indicator as a mechanical comparator for run out measurement, and roundness comparison.
6. Measurement of gear tooth elements by using gear tooth vernier caliper
7. Alignment Testing of lathe machine tool.

Examination Schedule Internal practical Sessional:

Attending classes, practicing programs & submitting respective assignment in time		5 x 4 = 20	
Viva - voce		5	
Total:		25	

Examination Schedule: External practical Sessional examination

Examiner: **Lecturer**

For submission of assignment in scheduled time		5 x 2 = 10	
On spot program		10	
viva voce		05	
Total		25	

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

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

G R O U P	Chapter	ONE OR TWO SENTENCE ANSWER QUESTIONS				G R O U P	Chapter	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		5	10	1	1 X 10 = 10	A		5	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	5	5 X 5 = 25
B		5				B		5			

List of Books:

Author	Title	Publication
N V Raghavendra L Krishnamurthy	Engineering Metrology & Measurements	Oxford
R.K.Rajput	Mechanical Measurement & Instrumentation	S.K. Kataria & Sons
R. K. Jain.	Engineering metrology	Khanna Publisher, Delhi
M. Mahajan	A text book of metrology	Dhanpat Rai and Sons,
I.C. Gupta	A text book of Engineering metrology	Dhanpat Rai and Sons,
M. Adithan and R.Bahl	Metrology Lab. Manual	T.T.T.I. Chandigarh.
K. J. Hume	A text book of Engineering metrology	Kalyani publishers
J.F.W. Galyer and C. R. Shotbolt	Metrology for Engineers	ELBS

2. IS/ International Codes:

- IS 919 – 1993 Recommendation for limits, fits and tolerances
- IS 2029 – 1962 Dial gauges.
- IS 2103 – 1972 Engineering Square
- IS 2909 – 1964 Guide for selection of fits.
- IS 2921 – 1964 Vernier height gauges
- IS 2949 – 1964 V Block.
- IS 2984 – 1966 Slip gauges.
- IS 3139 – 1966 Dimensions for screw threads.
- IS 3179 – 1965 Feeler gauges.
- IS 3455 – 1966 Tolerances for plain limit gauges.
- IS 3477 – 1973 Snap gauges.
- IS 6137 – 1971 Plain plug gauges.
- IS 3651 – 1976 Vernier Caliper
- IS 4218 - Isometric screw threads
- IS 4440 – 1967 Slip gauges accessories

IS 5359 – 1969 Sine bars

IS 5402 – 1970 Principle and applications of sine bars

IS 5939 – 1970 Sine angles, sine tables.



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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	
1	
Contents	
Chapter	Name of the Topic
01	Fundamentals and types of Mechanisms and velocity in Mechanism:
	<p>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.</p> <p>1.2 Inversions of Kinematic Chain:</p> <p>1.2.1 Inversion of four bar chain- four bar chain mechanism, coupled wheels of Locomotive & Pantograph.</p> <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>
	Hrs/week
	Hours
	10

02	<p>Cams and Followers: 2.1 Concept, definition and application of Cams and Followers. 2.2 Classification of Cams and Followers. 2.3 Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. 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: 3.1 Types of Drives – Belt, Chain, Rope, Gear drives & their comparison. 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) 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: 4.1 Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine (no Numericals). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance.(simple problems on determination of mass of fly wheel using crank effort diagram) 4.2 Governors - Types, concept, function and application & Terminology of Governors. (simple problems on watt & porter governor) 4.3 Comparison between Flywheel and Governor.</p>	08
05	<p>Brakes, Dynamometers, Clutches & Bearings: 5.1 Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer. 5.2 Construction and working of i) shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake. 5.3 Concept of Self Locking & Self energizing brakes. 5.4 Numerical problems to find braking force and braking torque for shoe & band brake. 5.5 Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. 5.6 Clutches- Uniform pressure and Uniform Wear theories. 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). 5.8 Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot. Torque & power lost in friction (no derivation). Simple numerical.</p>	10
	<p>Balancing & Vibrations: 6.1 Concept of balancing. Balancing of single rotating mass. Graphical</p>	03

	method for balancing of several masses revolving in same plane & different plane. 6.2 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.	
	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: (Any seven)

- 1) Find the ratio of time of cutting stroke to the time of return stroke for quick return mechanism of a shaper machine.
- 2) Study of different types of gear train: a) simple gear train – tumbler gears for speed reversing, b) compound gear train – All geared head stock, c) reverted gear train – Back gear in lathe, d) epicyclic gear train – differential.
- 3) Determination of velocity by relative velocity method (two problems) (use graphical method).
- 4) Determination of velocity by instantaneous centre method (two 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 two 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 / 4- wheelers.
- 8) Determination of power transmitted by any belt drive using any one dynamometer.
- 9) Dismantling and assembly of multiplate clutch of two-wheeler / 4-wheelers.
- 10) Determine graphically balancing of several masses rotating in a single plane/ several planes (use graphical method – 2 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	
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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

Name of the Course : Mechanical Engineering		
Subject Title: Professional Practices-II		
Course code:	Semester : Fourth	
Duration: 17 weeks	Maximum Marks : 50	
Teaching Scheme	Examination Scheme	
Theory : hrs/week	Practical: Internal Sessional Continuous Evaluation: 25 Marks	
Tutorial: hrs/week	Practical: External Sessional Examination: 25 Marks	
Practical : 3 hrs/week		
Credit: 2		
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 :-		
Sl. No.	The student will able to:	
1	<ul style="list-style-type: none"> Acquire information from different sources. 	
2	<ul style="list-style-type: none"> Prepare notes for given topic. 	
3	<ul style="list-style-type: none"> Present given topic in a seminar. 	
4	<ul style="list-style-type: none"> Interact with peers to share thoughts. 	
5	<ul style="list-style-type: none"> Prepare a report on industrial visit, expert lecture. 	
Pre-Requisite:-Nil		
Contents		Hrs/week
Chapter	Name of the Topic	
01	<p>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 :</p> <ul style="list-style-type: none"> Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant. Machine shop having CNC machines. State Transport workshop / Auto service station. City water supply pumping station. Manufacturing unit to observe finishing and super finishing processes. <p style="text-align: center;">OR</p> <p>Mini Project / Activities: (Any one) Individual student should submit a report of the same, to form a part of the term work.</p> <ol style="list-style-type: none"> 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. Dismantling of assembly (e.g. jig / fixtures, tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts. Make a small decorative water fountain unit. Toy making with simple operating mechanisms. 	09 Hrs.

02	<p>Information Search : Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any ONE topic. Following topics are suggested :</p> <ul style="list-style-type: none"> • Engine lubricants & additives • Automotive gaskets and sealants • Engine coolants and additives • Two and Four wheeler carburetor. • Power steering • Filters • Different drives/Transmission systems in two wheelers. • Types of bearings – applications and suppliers. • Heat Exchangers • Maintenance procedure for solar equipment. 	06 Hrs.	
03	<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:- Creation of work plane, Line, Circle, Rectangle, arc, Ellipse, curve, Move, Copy, Trim, Fillet, Chamfer, Extend, offset, Array, break,; Practice on 2D Drawing. • Generation of 3 D surface & solid model: Primitive surface & solid (plane, block, sphere, cone, torus, spring, spiral). • 3D operation: Extrude, fill in, revolve, drive surface, networking surface, surface from separate curves, extension of surface, fillet, editing of surface, blend, Pocket, shaft, Groove, Hole, Slot, Stiffener, Draft, trim, curve wrapping & unwrapping; Boolean Operations: Add, Remove, Intersection; Transformation features: Translation, Rotation, mirror; Generation of 3 D Model Practice. • Extraction of 2D from 3D model: Front View, Side view, Top View, Isometric view, sectional view, limited view (broken view), Dimensioning, Inserting frame and Title Block; Practice. <p>Exercise: Rigid flange coupling, knuckle joint, tray, bracket, cylinder-cylinder intersection model, BOM.</p>	30 Hrs.	
Total		45 Hrs.	
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.Subramanian & 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			
Suggested List of Laboratory Experiments :- Nil			
Suggested List of Assignments/Tutorial :- Nil			

Examination Scheme:	
Internal Practical Sessional Examination	
Topic	Marks
1 - Submission of Report on industrial visit or mini project on scheduled date.	5
2 - Submission of one assignment on information search on scheduled date.	5
3 - Practice of CADD software.	10
4 - Viva – voce.	5
Total:	25
External Practical Sessional Examination	
Topic	Marks
1 - Submission of signed report & assignment.	5
2 - On spot CADD Drawing.	15
3 - Viva voce.	5
Total:	25