PROPOSED CURRICULAR STRUCTURE FOR PART – II (2nd YEAR) OF THE FULL-TIME DIPLOMA COURSES IN ENGINEERING & TECHNOLOGY

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES
COURSE NAME: FULL TIME DIPLOMA IN : MECHANICAL ENGINEERING
DURATION OF COURSE: 6 SEMESTERS
SEMESTER: THIRD
BRANCH: : MECHANICAL ENGINEERING

Sl No	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR		TOTAL MARKS
						TA	CT	TOTAL		INT	EXT	
1	Advanced Strength of Materials	3	2	-	2	5	10	15	35	25	25	100
2	Thermal Engineering-I	4	3	-	2	10	20	30	70	25	25	150
3	Manufacturing Technology	4	2	-	4	10	20	30	70	50	50	200
4	Fundamentals of Electronics	4	3	-	2	10	20	30	70	25	25	150
5	Engineering Materials	3	3	-	-	10	20	30	70	-	-	100
6	M.E.Drawing	5	3	-	4	5	10	15	35	50	50	150
7	Professional Practice-I	1	-	-	2	-	-	-	-	25	25	50
TOTAL		24	16	-	16	50	100	150	350	200	200	900

STUDENT CONTACT HOURS PER WEEK: 32 hrs
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, INT-Internal Assessment , EXT-External Assessment, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES
COURSE NAME: FULL TIME DIPLOMA IN : MECHANICAL ENGINEERING
DURATION OF COURSE: 6 SEMESTERS
SEMESTER: FOURTH
BRANCH: : MECHANICAL ENGINEERING

Sl No	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR		TOTAL MARKS
						TA	CT	TOTAL		INT	EXT	
1	Development of Life Skill-II	2	1	-	2	-	-	-	-	25	25	50
2	Thermal Engineering-II	4	3	-	2	10	20	30	70	25	25	150
3	Production Processes	5	3	-	4	10	20	30	70	50	50	200
4	Principles of Electrical Engineering	4	3	-	2	10	20	30	70	25	25	150
5	Computer Programming	2	1	-	2	-	-	-	-	25	25	50
6	Theory of Machines & Mechanism	4	3	-	2	10	20	30	70	25	25	150
7	Professional Practice-II	2	-	-	3	-	-	-	-	25	25	50
TOTAL		23	14	-	17	40	80	120	280	200	200	800

STUDENT CONTACT HOURS PER WEEK: 31 hrs
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, INT-Internal Assessment , EXT-External Assessment, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.

Mechanical Engineering

1 Advanced Strength of Materials

Name of the Course : Mechanical Engineering **Subject: Advanced Strength of Materials**	
Course code: ME	**Semester : Third**
Duration : 17 Weeks	**Maximum Marks : 100**
Teaching Scheme	**Examination Scheme**
Theory : **2** hrs/week	End Semester Exam: **35** Marks
Tutorial: hrs/week	Teacher's Assessment (Assignment & Quiz): **5** Marks
Practical : **2** hrs/week	Internal Assessment: **10** Marks
Credit: **3**	Practical Sessional internal continuous evaluation: **25** Marks
	Practical Sessional external examination: **25** marks

Aim :-	
SL No	
1.	To understand & analyze various types of stresses & strains along with main causes of failure of machine parts.
2.	To study the effect of combined stress on different machine parts.
3.	To understand principles of machine design.
Objective :-	
S No	**The student will able to**
1	Calculate bending stress and prepare shear stress distribution diagram at different cross section in a beam
2	Calculate maximum & minimum stresses for different machine elements under combined bending & direct stress.
3	Understand & analyze the basic principles involved in the behavior of machine parts under load in the context of designing it.
4	Calculate strain energy for spring and axially loaded members
5	Estimate principal stresses and maximum shear stress for a given combined loading by analytical & Mohr's circle method.
6	Calculate the power transmitted by the solid & hollow shafts.
7	Understand & analyze different parameters of closed coil helical spring.
Pre-Requisite:-	
Sl. No	Elementary knowledge on engineering mechanics
1.	Differential and integral calculus
2.	Elementary knowledge on strength of materials

Contents		Hrs/week	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**1.0 Strain Energy** 1.1 Concept, derivation & use of expression for Strain energy of axially loaded members of uniform cross section under gradual, sudden / impact load (simple problems). 1.2 Strain energy due to self-weight for uniform cross section member (simple problems).	**03**	**05**
02	**2.0 Bending & Shear stresses** 2.1 Theory of pure bending, equation of bending. 2.2 Assumptions in the theory of bending, moment of resistance, section modulus & neutral axis (simple problems on bending stress having	**06**	**08**

	rectangular, circular & I section beam) 2.3 Shear stresses in beam & its distribution diagram over various cross section of beam under point load/udl (No problem)		
03	**3.0 Combination of Bending & Direct stresses** 3.1 Determination of maximum & minimum stresses for members under axial load, eccentric load along one principal axis, bending stresses. 3.2 Application of the above concepts for machine parts such as offset links, C-clamp, Bench vice, Drilling machine frame, stresses at base of a short column, total stress variation diagrams. (Simple problems on above applications)	**06**	**06**
04	**4.0 Principal Planes & Principal Stresses** 4.1 Definition of principal plane & principal stresses. 4.2 Expression for normal and tangential stress, maximum shear stress. 4.3 Stresses on inclined planes. 4.4 Position of principal planes & planes of maximum shear. 4.5 Graphical solution using Mohr's circle of Stresses	**06**	**06**
05	**5.0 Torsion of solids and hollow circular shafts:** 5.1 Concept of Pure Torsion, Torsion equation for solid and hollow circular shafts, Assumptions in theory of pure Torsion. 5.2 Comparison between Solid and Hollow Shafts subjected to pure torsion (no problem on composite and non homogeneous shaft)	**05**	**05**
06	**6.0 Springs:** 6.1 Types of spring, uses 6.2 Determination of shear stress & its distribution, deflection, stiffness, solid length, concept of mean radius of coil & spring index (simple problem) 6.3 Spring in series & parallel.	**04**	**05**
	Sub Total:	30	35
	Internal Assessment Examination & Preparation of Semester Examination	4	
	Total:	34	

Practical:

Skills to be developed:

Intellectual skills:

1. Calculate coefficient of friction for available pair of surface and angle of repose.
2. Establish law of simple machine
3. Identification of different parts of machine and their function.
4. Interpretation failure patterns of different metal under different action.
5. Extrapolating test result or observation during test.

Motor Skills:

1. Study and demonstration of Testing Machine & its attachments (if any).
2. Sketch of standard specimen, arrangement for test on respective machines.
3. Measurement of different parameters.
4. Testing different metals and comparison of experimental result.
5. Handling Instrument.
6. Observing behavior of different metal during test.
7. Plotting graph

List of Practical: (sl. No. 1 & 2 compulsory & at least three from the rest)

1. To determine coefficient of friction of any pair of surfaces and determination of angle of repose.
2. To find MA, VR, Efficiency, Ideal Effort, Effort & Load lost in friction for various loads and establish law of machine and calculate maximum efficiency and Also check the reversibility of a machine (any two) 1)

Differential axle and wheel, 2) Weston's differential pulley block, 3) Geared pulley block, 4) Single purchase crab, 5) Double purchase crab, 6) Worm and worm wheel, 7) Two sheave and three sheave pulley block

3. Tension Test on mild steel/ Aluminium & compression test on cast iron on Universal Testing Machine.
4. Direct Shear Test of mild steel on Universal Testing Machine.
5. Brinell Hardness Test on Mild Steel / Aluminium.
6. Rockwell hardness Test on Hardened Steel.
7. Izod & Charpy - Impact tests of a standard specimen.
8. Torsion Test on Mild steel bar.

Assignments:

1. Estimation of principal stresses and maximum shear strain for a given combined loading by analytical & Mohr's circle method. (At least two problems.)
2. Estimate cross section of machine parts under combined bending and direct stress considering respective mechanical properties.

Note: Total students have to be divided into 10 groups. Each group shall be allotted two different problems on above mentioned areas as home assignment. Problems have to be submitted by each student separately.

List of Books:

Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
R S Khurmi	Strength of Materials		S.Chand & Co
S. Ramamurtham & R Narayanan	Strength of Materials		Dhanpat Rai & Publication
R.K. Bansal	Strength of Materials		Laxmi Publication Pvt. Ltd
B.K. Sarkar	Strength of Materials		Tata McGraw-Hill
S.S.Bhavikatti	Strength of Materials		Vikas Publishing House Pvt. Ltd
R.K. Rajput	Strength of Materials		S.Chand & Co
M. Chakraborty	Strength of Materials		S.K.Kataria
Bhandari	Design of Machine Elements		McGraw-Hill
R.S. Khurmi & J. K. Gupta	A Text Book of Machine Design		S.Chand & Co

Reference books :-			
R. Subramanian	Strength of Materials		Oxford Press
S.P. Timoshenko, D.H. Young	Elements of Strength of Materials		West Press Pvt. Ltd
D. S. Prakash Rao	Strength of Materials – A Practical Approach		Universities Press
Egor P Popov	Engineering Mechanics of Solid		Prentice Hall of India

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	1, 2 & 3	5	5	At least 2
B	4, 5 & 6	5	5	At least 2
From above mentioned groups total 5 questions to be attempted				5*5 = 25
A	1, 2 & 3	1	5	5*1 =5
B	4, 5 & 6	1	5	5*1 =5
			Total:	**35**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: Examiner- Lecturer in Mechanical Engg. / Jr. Lecturer.

Five No. of Experiments attended & respective lab note submitted in due time		5*3 =15	
Viva-voce		10	
		Total: 25	
External Examination: Examiner- Lecturer in Mechanical Engg. / Jr. Lecturer.			
Signed Lab Note Book (for five experiments)		**5*2 = 10**	
On spot experiment(one for each group consisting 5 students)		**10**	
Viva voce		**5**	
		Total: 25	

2 THERMAL ENGINEERING - I

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Name of the Course : Mechanical Engineering **Subject: THERMAL ENGINEERING - I**	
Course code: ME	**Semester : Third**
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 of various sources of energy.
2	To understand the concept of energy, work, heat & their conversion.
3	To understand the concept of thermodynamics and study of various thermodynamic laws with their applications.
4	To study the properties of gas & properties of steam and their application in different thermodynamic system.
5	To study the basics of Heat transfer and its application.
Objective :-	
S. No.	The Students should be able to:
1.	• Know various sources of energy & their applications.
2.	• Apply fundamental concepts of thermodynamics to thermodynamic systems.
3.	• Understand various laws of thermodynamics.
4.	• Apply various gas laws & ideal gas processes to various thermodynamic systems.
5.	• Understand the properties of steam and should be able to solve simple numerical of two phase system by using steam table / Mollier chart.
6.	• Understand the basics of Heat transfer and its application.
Pre-Requisite: Elementary knowledge on Physics and basic Mathematics	

Contents	Hrs/week
THERMAL ENGINEERING- I	

Chapter		Name of the Topic	Hours	Marks
		GROUP-A		
1	1.0	SOURCES OF ENERGY	06	
	1.1	Brief description of energy sources, including Classification of energy sources. Renewable and Non-Renewable sources of energy. Conventional and Non-Conventional sources of energy.		
	1.2	Brief description on available form of energy, conversion to useful form and its application.		
	1.2.1	Fossil fuels, including CNG, LPG.		
	1.2.2	Solar energy, including		
	1.2.3	Flat plate and concentrating collectors. Solar Water Heater. Photovoltaic Cell, Solar Distillation. Wind energy, Tidal energy, Geothermal energy.		
	1.2.4	Biomass energy, including Biogas, Bio-diesel.		
	1.2.5	Hydroelectric energy, Nuclear energy		
	1.2.6	Fuel cell		
2	2.0	**FUNDAMENTALS OF THERMODYNAMICS**	10	
	2.1	**Fundamental concepts of the following:**		
	2.1.1	Pure substance.		
	2.1.2	System, Boundary, Surrounding.		
	2.1.3	Classification of system, including open system, closed system, isolated system.		
	2.1.4	Properties of system, including Intrinsic and Extrinsic properties with units and its conversion like Pressure (Atmospheric Pressure, Gauge Pressure and Absolute pressure), Volume, Sp-mass and Temperature.		
	2.1.5	State of a system, change of state, Path, Process.		
	2.1.6	Equilibrium of a system, including Mechanical, Thermal, Chemical and Thermodynamic equilibrium.		
	2.1.7	Cycle, including Thermodynamic cycle and Mechanical cycle.		
	2.1.8	S.T.P and N.T.P.		
	2.2	**Energy:**		
	2.2.1	Definition and units of Transient energy (Work and Heat), Stored energy (P.E., K.E and Internal energy), Point Function & Path Function.		
	2.2.2	Displacement work & Flow work.		
	2.2.3	Definition & units of Power.		
	2.2.4	Definition and units of Enthalpy.		
	2.2.5	Definition of Specific heat, Specific heat at constant pressure (Cp), Specific heat at constant volume (Cv) and Adiabatic Index (Cp/Cv).		
	2.3	**Laws of Thermodynamics and their Application:**		
	2.3.1	Zeroth Law of Thermodynamics and Temperature measurement.		
	2.3.2	Principle of Energy Conservation.		
	2.3.3	First law of Thermodynamics, Simple Energy Equation for non-flow process $(Q - W) = \Delta E$, Steady Flow Energy Equation and its application to system like boiler, nozzle, turbine, compressor & condenser (Simple numerical), Concept of Perpetual Motion Machine of 1st kind, limitations of First law of Thermodynamics.		
	2.3.4	Second Law of Thermodynamics: Kelvin – Plank Statement & Clausius' Statement, Heat Engine, Heat Pump and Refrigerator, Thermal Efficiency, C.O.P., Concept of Perpetual Motion Machine of 2nd kind, definition and units of Entropy.		

3	3.0 3.1 3.2 3.3 3.5	**PROPERTIES OF GASES** Definition and comparison of Ideal Gas & Real Gas. Charle's Law, Boyle's Law and Avogadro's Law, Equation of State (PV=mRT), Characteristic Gas Constant and Universal Gas Constant. Relation among two Specific Heats (Cp & Cv) with Characteristic Gas Constant. Ideal gas processes: Governing equation of processes (Pressure & Volume relations), Representation of the processes on P-V and T-S diagram, Deduce the expression to calculate Work transfer, Heat Transfer, Change of I.E., change of enthalpy and Change of Entropy for the following Processes: Constant Pressure Process, Constant volume Process, Constant temperature Process, Adiabatic Process & Polytropic Process (Simple numerical on Processes).	10	
		GROUP-B		
4	4.0 4.1 4.2 4.3 4.4 4.5	**PROPERTIES OF STEAM** Explanation of steam generation process with the help of P-V & T-S diagram. Basic terms & properties of steam: Saturation Temperature, Saturation Pressure, Saturated liquid, Dry Saturated Steam, Wet Saturated Steam, Saturated steam, Superheated Steam, Critical Temperature, Dryness Fraction, Degree of Superheat, Sensible Heat, Enthalpy of Evaporation or Latent Heat of Evaporation, Enthalpy of Steam, Specific Volume, Entropy of Steam. (Simple numerical) Steam Table & its use, Enthalpy- Entropy diagram of steam (Mollier Chart) and its use. Measurement of dryness fraction: Throttling process, Steam Calorimeters, Types and Principle for calculation of Dryness Fraction of Steam using a) Throttling Calorimeter, & b) Combined Separating & Throttling Calorimeter (Simple numerical). Comparison of Gas & Vapour Vapour Processes: Constant Pressure, Constant Volume, Constant Entropy & Constant Temperature processes and representation of the processes on P-V, T-S & H-S diagram,(Simple numerical using Steam Table and Mollier Chart)	10	
5	5.0 5.1 5.2 5.2.1 5.3 5.3.1 5.3.2 5.4	BASIC OF HEAT TRANSFER Explanation of Three Basic Modes of Heat Transfer (Conduction, Convection and Radiation). Fourier's Law of heat conduction, Thermal Conductivity and concept of Thermal Resistance. Heat Transfer through Plane Homogeneous Wall, Heat Transfer through Composite Wall, Heat Transfer through Hollow Cylinder and Heat Transfer through combined Conduction and Convection (Simple numerical). Stefan-Boltzman Law of heat radiation with explanation of terms with unit. (No numerical) Definition and inter relation of Absorptivity, Reflectivity and Transmissivity Concept of Black and Gray Bodies. Principle of heat exchanger, Construction, working principle and	09	

		application of Shell and Tube, Plate Type, Multiphase Heat Exchangers. (No deduction and numerical)		
			Sub Total:	45
			Internal Assessment Examination & Preparation of Semester Examination	6
			Total	51

Practical:

Skills to be developed:

Intellectual Skill :

1. Understand different sources of energy and their applications.
2. Understand various concepts and fundamentals of thermodynamics.
3. Understand concepts and laws of ideal gasses.
4. Interpret steam tables, mollier chart and relationship between different thermodynamic properties.
5. Understand modes of heat transfer and concept of heat exchanges.

Motor Skills :

1. Conduct trial on solar water heating system.
2. Study of schematic layout of Wind Power Generation Plant / Biogas Plant / Hydroelectric Power Plant.
3. Conduct trial on Bomb Calorimeter for calculating the calorific value of coal.
4. Conduct trial on Dryness Fraction Measuring Instrument for calculating the dryness fraction of steam.
5. Conduct trial on the setup for calculation of thermal conductivity of metal rod.

List of Practical:

1. Study of Solar Water Heating System.
2. Study of schematic layout of Wind Power Generation Plant / Biogas Plant / Hydroelectric Power Plant.
3. Study of Bomb Calorimeter.
4. Study of Pressure Gauge and its use.
5. Calculation of Characteristic Gas Constant of air based on some practical data.
6. Study and Measurement of Dryness Fraction of Steam by Dryness Fraction Measuring Instrument.
7. Calculation of thermal conductivity of a solid metallic rod.
8. Verification of Stefan-Boltzman's law.
9. Study and compare various Heat Exchangers such as Radiators, Condensers, Evaporators (Shell and Tube Heat Exchanger), Plate Type Heat Exchangers.

Note: At least FIVE (05) no. 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.
R.K. Rajput	Non Conventional Energy Sources and Utilisation		S.Chand & Company Ltd., 2012.

G.D. Rai	Non Conventional Energy Sources -		Khanna Publishers, New Delhi,1999.
B.H.Khan	Non-Conventional Energy Resources		Tata Mc Graw Hill, 2nd Edn, 2009

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :-

1. **Prepare a chart showing different sources of energy and their applications.**
2. **Draw P-V, T-S & H-S plane of steam and display saturated liquid line, dry saturated vapour line, wet saturated steam zone, critical point, triple point, superheated zone& under cooled liquid zone.**
3. **Draw P-V, T-S, H-S & P-T plane of steam and show constant pressure, constant temperature, constant volume & constant entropy line.**

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/ Demonstrator			
Five No. of Experiments / Study attended & respective lab note submitted in due time	5*3 = 15		
VIVA VOCE	10		
TOTAL	25		

EXTERNAL Examination: Examiner- Lecturer in Mechanical Engg. / Jr. Lecturer/ Demonstrator			
Submission of Signed Lab Note Book (for five	5*2 = 10		

experiments/study)			
On spot experiment (one for each group consisting 15 students / explanation of study item)	10		
VIVA VOCE	5		
TOTAL	25		

3 Manufacturing Technology

Name of the Course : Diploma in Mechanical Engineering **Subject**: Manufacturing Technology		
Course code: ME		**Semester :** Third
Duration : 17 week		**Maximum Marks : 200**
Teaching Scheme		**Examination Scheme**
Theory : 3 hrs/week		Semester Exam: **70** Marks
Tutorial: hrs/week		Teacher's Assessment (Assignment & Quiz): **10** Marks
Practical : 4 hrs/week		Internal Assessment: **20** Marks
Credit: 5		Practical Sessional internal continuous evaluation: **50** Marks
		Practical Sessional external examination: **50** marks
Aim :-		
S.No		
1	The development in materials technology, computer technology and economics, coupled with knowledge about the requirements and demands of manufacturing, are the corner stones of the activities.	
Objective :-		
S No	The student will able to	
1	· Know and identify basic manufacturing processes for manufacturing different components.	
2	· Operate & control different machines and equipments.	
3	· Inspect the job for specified dimensions.	
4	· Produce jobs as per specified dimensions.	
5	· Select the specific manufacturing process for getting the desired type of output.	
6	· Adopt safety practices while working on various machines.	
Pre-Requisite:-		
S.No		
1	Depending on the educational background of the student, the previous knowledge is examined in order to determine if any supplementary examination in relevant subjects may be necessary.	
Contents		Hrs/week
Chapter	*Name of the Topic*	**Hours**
GROUP:A		

01	**INTRODUCTION** 1.1 Classification of manufacturing processes: Shaping process, joining process & Finishing process	02
02	**Forging** 2.1 Introduction of Hot Working & Cold Working. Examples 2.2 Forging Processes – Drop forging, Upset forging, Die forging or press forging. 2.3 Types of dies - Open Die, Closed Die(Single Impression and Multi-impression) Closed die Forging operations - Fullering, Edging, Bending, Blocking, Finishing 2.4 Forgeable material and forgeability, Forging temperature, Grain flow in forged parts**,** Types of Presses and hammers.	04
03	**Rolling and Extrusion** 3.1 Principles of rolling and extrusion. 3.2 Hot and cold rolling. 3.3 Types of rolling mills. 3.4 Different sections of rolled parts. 3.5 Methods of extrusion – Direct, Indirect, backward & impact Extrusion, Hot extrusion, Cold extrusion 3.6 Advantages , disadvantages & applications of rolling & forging	05
04	**Press working** 4.1 Types of presses and Specifications. 4.2 Press working operations - Cutting, bending, drawing, punching, banking, Notching, lancing, piercing, coining, embossing. 4.3 Die set components.- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot, knockout. 4.4 Punch and die Clearances for blanking and piercing, effect of clearance .	05
GROUP:B		
05	**Lathe** **5**.1 Cutting tool nomenclature & tool signature of single point cutting tool. 5.2 Orthogonal & oblique cutting, chip formation & type of chips 5.3 Types of lathes – light duty, Medium duty and heavy duty geared lathe, CNC Lathe 5.4 Specifications of lathe. 5.5 Basic parts and their functions. 5.6 Operations and tools – Centering, facing, Turning, parting off, undercutting, grooving, Knurling, drilling, reaming, boring, thread cutting	06
06	**Drilling** 6.1 Classification. 6.2 Basic parts and their functions – Pillar drilling machine & Radial drilling machine. 6.3 Types of operations. 6.4 Specifications of drilling machine. 6.5 Types of drills and reamers	04
07	**Milling** 7.1 Classification., Specifications& applications 7.2 Basic parts and their functions – column and knee type, universal milling machine 7.3 Types of operations(up milling, down milling) 7.4 Types of milling cutters	03

GROUP:C		
08	**Casting** 8.1 Patterns - Material used, types, Patterns allowances, Cores, Core allowances. Core prints. 8.2 Moulds - Mould materials, Types of sand, Mounding processes: Sand molding, Pit molding, machine molding. Shell molding. 8.3 Melting practice. Types of furnaces with specific application Cupola furnace, Electric arc furnace. 8.4 Casting principle and operation 8.5 Special casting processes. viz die casting, centrifugal casting, Investment casting. 8.6 Casting defects	08
09	**Welding** 9.1 Classification. 9.2 Gas welding techniques. 9.3 Types of welding flames. 9.4 Arc Welding – Principle, Equipment, Applications 9.5 Shielded metal arc welding. (Principle & Application) 9.6 Submerged arc welding. (Principle & Application) 9.7 TIG / MIG welding. (Principle & Application) 9.8 Resistance welding.(Principle & Application) - Spot welding, Seam welding, Projection welding 9.9 Welding defects. 9.10 Brazing and soldering: Types, Principles, Applications	08
	Sub Total:	45
	Internal Assessment Examination & Preparation of Semester Examination	6
	Total	51

Practical:

Skills to be developed:

Intellectual Skills:

1. Identify basic manufacturing processes.
2. Understand the various method of operations in lathe m/c ,drill m/c & milling m/c
3. Understand the various method of forging
4. Identify joining methods for fabrication

Motor Skills:

1. Operate lathes & drilling machines.
2. Use welding machines and equipment
2 Use smithy/forging equipments
3. Set the tools, jobs and decide cutting parameters of machines
5. Inspect dimensions of jobs using measuring instruments

LIST OF PRACTICALS, Total 60 Hrs

1] Study of lathe (identify different parts, drives: (cone pulley drive& all gear drive), feed mechanism: (feed reversing mechanism and feed gear box, apron mechanism), work holding devices, tool holding devices, types of tool used in lathe work, study tool angles for a general purpose cutting tool used in lathe, setting of work and tools, operate lathe without work).

2] Practice on making a job involving Lathe operations like Facing, plain turning, Step Turning, grooving, knurling &chamfering; study & use of measuring instrument (batch of 10 students per job)

3] Study of drilling Machine (identify different parts, drive & feed mechanism, types of drill, drill holding device, work holding device, setting work and drill, operate drill machine).

4] Practice on making a job involving drilling operation of different diameter hole at different location, reaming operation at a particular hole, counter sinking operation at one hole. (batch of 05 students per job)
5] Study of different types of welding machines & equipments (Gas Welding set, Electric Arc Welding machine, Electric Resistance Welding machine), hand tools used, safety items used, connection details.& Study of different types of welding joints (Lap, Butt, Tee, Corner joint and edge joint) and different positions of welding (flat horizontal, vertical welding and over head welding); Bead practice, edge preparation, Tag welding.
6] Practice on making the welding joint: a) lap joint (material 25mmX6 mm MS flat – 100mm length), b) butt joint material 25mmX6 mm MS flat – 50mm length) c) T – Joint (material 25mmX6 mm MS flat – 50 mm length) d) Corner joint (material 25mmX6 mm MS flat– 50 mm length). (batch of 05 students per job)
7] Study of different types of cold & hot working process (Cold Working: shearing, bending, Hot working: Drawing Down, Upsetting, Punching, and Flattening), Study of tools & machines used in Smithy/Forging Shop. And Practice on different operations in smithy. (Any one from shearing, bending, drawing down, upsetting, punching, flattening).
8] Study of different types tools, measuring instrument and machines used in fitting shop and making an 'L' shaped job (material: 25 X 6mm MS flat – 50mm length).

NOTE:

a) Sl. No. 1, 3, & 5 are compulsory and submission of respective home assignments (20 Hrs.).
b) From the rest at least 4 tasks have to be completed (40 Hrs.).

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	1,2,3,4	08	ANY 20	1	20	4	FIVE (AT LEAST ONE FROM EACH GROUP)	10	50
B	5,6,7	06				3			
C	8,9	06				3			

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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
B.S.Raghuwanshi	A Course in Workshop Technology Vol I & II		Dhanpat Rai & Co
D. L. Wakyl	Processes and design for manufacturing		Prentice Hall
KALPAKJIAN & SCHMID	Manufacturing Processes		Pearson Education, New Delhi
Amitabh Ghosh , Mallik	Manufacturing Science		East-West Press Pvt. Ltd.
HMT, Banglore	Production Technology		Tata Mc-Graw Hill
O. P. Khanna and Lal	Production Technology - Volume I & II		Dhanpat Rai Publications.
P. N. Rao	Manufacturing Technology Metal Cutting & Machine tools		Tata McGraw-Hill
Girling	All about Machine Tools		New age international limited.
Pabla B. S. M. Adithan	CNC machines		New age international limited.
R.B. Gupta	Production Technology		Satya Prakashan New Delhi
W.A.J. Chapman	Workshop Technology - Volume I , II & III		Viva Books (p) Ltd.
Jhon A Schey	Introduction to Manufacturing Processes		McGraw Hills International
M. Aduthan and A. B. Gupta	Manufacturing Technology		New Age International
JT. Black, Ronald A. Kohser	Degarmo's Materials and Processes in Manufacturing 11th Edition		Wiley

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

5 Engineering Materials

Name of the Course : Mechanical Engineering **Subject: Engineering Materials**			
Course code: ME		**Semester : Third**	
Duration : 17 weeks		**Maximum Marks : 100**	
Teaching Scheme		**Examination Scheme**	
Theory : **3** hrs/week		Internal Assessment: **20** Marks	
Tutorial: hrs/week		Teacher's Assessment (Assignment & Quiz): **10** Marks	
Practical : hrs/week		End Semester Exam: **70** Marks	
Credit: **3**			
Aim :-			
S.No			
1	To provide students with a specialist education and training in the area of metals, ceramics, polymers and composites for industrial engineering applications from biomedical device manufacture to future energy solutions.		
Objective :-			
S No	The student will able to		
1	know the properties of Engineering Materials like Metals, non-metals, ferrous metals and non-ferrous metals		
2	Interpret Iron –Iron Carbide phase equilibrium diagram to find temperatures for heat treatment processes.		
3	Select the proper materials for different applications like cutting tools, dies, gears & other applications.		
4	Understand various heat treatment processes & its applications for various components to improve its mechanical properties.		
5	Understand powder metallurgy process and its applications.		
6	Understand Non Destructive testing methods & its applications		
Pre-Requisite:-Nil			
Contents		Hrs/week	
Chapter	**Name of the Topic**	**Hours**	Marks
GROUP-A			
01	**Mechanical Engineering Materials and their Properties** 1.1 Introduction, Classification and Application of Engineering materials I.S. specification of materials like plain carbon steel, Grey Cast iron, low alloy steels & bearing Materials. 1.2 Properties of metals- Physical Properties – Structure, Density, Melting point. Mechanical Properties –hardness, hardenability, brittleness, fatigue, thermal conductivity, electrical conductivity, thermal coefficient of linear expansion 1.3 Introduction to Corrosion, types of Corrosion, Corrosion resisting materials	05	05
02	**Ferrous Metals and Alloys** 2.1 Characteristics and application of ferrous metals 2.2 Phase equilibrium diagram for Iron and Iron Carbide. 2.3 Flow diagram for production of Iron and Steel, Classification, composition and uses of cast iron 2.4 Classification, composition and application of low carbon steel, medium carbon steel and high carbon steel with their chemical composition. Effect of sulphur, silicon and phosphorous on plain carbon steel. 2.5 Alloy Steels: - Low alloy steel, high alloy steel, tools steel & stainless steel. Effect of various alloying elements such as – Chromium, nickel, manganese, molybdenum, tungsten, vanadium. 2.6 Tool Steels (properties & applications): - High speed Steels (HSS), Hot & cold Working dies, shear, punches.	10	18

	2.7 Magnetic materials: - Properties & Applications of commonly used magnetic materials (Permanent magnets and temporary magnets). 2.8 Special Cutting Tool Materials (Properties & Applications): Diamond, Stelites , Tungsten Carbide & Ceramics.		
GROUP-B			
03	**Non Ferrous Metals and Alloys** 3.1 Properties, applications of Copper alloys (naval brass, muntz metal, Gun metal & bronzes), Aluminium alloys (Y-alloy & duralumin) & bearing materials like white metals, leaded bronzes & copper lead alloys. 3.2 Desired properties of bearing materials.	06	12
04	**Heat Treatment of Steels** 4.1 TTT Diagram 4.2 Introduction to Heat treatment processes such as Annealing, subcritical annealing, Normalizing, Hardening, Tempering (Austempering & Martempering) - Principle, Advantages, limitations and applications. 4.3 Surface Hardening - Methods of surface hardening, i) case hardening ii) Flame Hardening, iii) Induction Hardening, iv) Nitriding, v) Carburizing Principle, advantages, limitations and applications.	8	15
GROUP-C			
05	**Non Metallic Materials** 5.1 Polymeric Materials – Introduction to Polymers- types, characteristics, properties and uses of Thermoplastics, Thermosetting Plastics & Rubbers. 5.2 Thermoplastic Plastics – Uses of ABS, Acrylics, Nylons and Vinyls. 5.3 Thermosetting Plastics – Characteristics and uses of polyesters, Epoxies, Melamines & Bakelites. 5.4 Rubbers – Neoprene, Butadiene, Buna & Silicons – Properties & applications. 5.5 Properties and applications of following Engineering Materials – Ceramics, Abrasive, Adhesive and Insulating materials such as Cork, Asbestos, Thermocole and Glass Wool. 5.6 Introduction to Composite Materials – Properties & Applications of Laminated & Fiber reinforced materials.	08	10
06	**Powder Metallurgy** 6.1 Advantages, limitations and applications of Powder Metallurgy for engineering products. 6.2 Brief Description of Process of Powder Metallurgy – Powder making, blending, compacting, sintering, infiltration & impregnation. 6.3 Applications of Powder metallurgy for tungsten carbide tip tools & porous bearing.	04	05
07	**Nondestructive Testing** 7.1 Importance of Non-destructive testing, Difference between Destructive and Nondestructive testing. 7.2 Nondestructive testing methods – Radiography (X-Ray & Gamma Ray), Ultrasonic crack detection, Dye penetrant test, Magnaflux test – Comparison & applications.	04	05
	Sub Total	45	70
	Internal Assessment Examination & Preparation of Semester Examination	06	
	Total:	51	

Text Books

Name of Authors	Titles of the Book	Edition	Name of the Publisher

O.P.Khanna	A Text Book of Material Science and Metallurgy		Dhanpat Rai and Sons [1999]
Dr.V.D. Kodgire	Material Science and Metallurgy		Everest Publishing House [1990]
R.K.Rajput	Material Science and Engineering		S.K.Katari and Sons [2002 reprint 2003]
S.K.Hazra and Choudhari	Material Science and Processes		Indian Book Distribution Co. [1982]
Kenneth G. Budinski and Micheal K. Budinski	Engineering Materials Properties and Selection		Pearson Education, New Delhi
ASME	ASME Material Manuals		ASME
Sidney H. Avner	Introduction to Physical metallurgy		Tata Mc Graw Hill edition (2^{nd})
P. C. Sharma	A Text Book of Production Technology.		S. Chand & Co.
Rajan Sharma & Sharma	Heat Treatment		PHI
Rghavan	Material Science & Engineering		PHI

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :-

1. **Flow diagram of steel making processes.**
2. **Flow diagram of production of pig iron.**
3. **Iron & iron carbide equilibrium diagram**
4. **T T T diagram**

EXAMINATION SCHEME

GROUP	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	06	20	1	20	3	FIVE (AT LEAST ONE FROM EACH GROUP)	10	50
B	3,4	06				3			
C	5,6,7	8				4			

6 Mechanical Engineering Drawing

Name of the Course : Mechanical Engineering **Subject: Mechanical Engineering Drawing**	
Course code: ME	**Semester : Third**
Duration : 17 weeks	**Maximum Marks : 150**
Teaching Scheme	**Examination Scheme**
Theory : **3** hrs/week	Semester Exam: **35** Marks
Tutorial: hrs/week	Teacher's Assessment (Assignment & Quiz): **5** Marks
Practical : **4** hrs/week	Internal Assessment: **10** Marks
Credit: **5**	Practical Sessional internal continuous evaluation: **50** Marks
	Practical Sessional external examination: **50** marks

Aim :-	
SL No	
1.	Understanding of drawing, which includes clear spatial visualization of objects and the proficiency in reading and interpreting a wide variety of production drawings.
2.	Developing drafting skill to draw various component and assembly drawing
3.	

Objective :-	
S No	**The student will able to**
1	Interpret industrial drawings
2	Interpret instructions related to manufacturing of components.
3	Use IS convention of representing various machine components.
4	Visualize the assembly of a given set of details of machine components.
5	Know the significance & use of tolerances of size, forms & positions.

Pre-Requisite:-	
S.No	
1	Sound pictorial ability.

Contents		Hrs/week	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Sectional Views** To draw different (front view, side view and top view) orthographic and sectional views from given Isometric views of casting and machine parts.	**10**	
02	**Intersection of solids** Curves of intersection of the surfaces of the solids in the following cases (a) Prism with prism, Cylinder with cylinder, & Prism with Cylinder When (i) the axes are at 90^0 and intersecting (ii) The axes are at $90^0$and Offset (b) Cylinder with Cone When axis of cylinder is parallel to both the reference planes and cone resting on base on HP and with axis intersecting and offset from axis of cylinder	**10**	
03	**Developments of Surfaces** Developments of Lateral surfaces of oblique objects (cylinder, cone & pyramids) and their applications such as tray, funnel, Chimney, pipe bend, transition piece (square to circular).	**10**	
04	1. Standard convention using SP – 46 (1988)	**04**	

	(a) Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber (b) Long and short break in pipe, rod and shaft. (c) Ball and Roller bearing, pipe joints, cocks, valves, internal / external threads. (d) Various sections- Half, removed, revolved, offset, partial and aligned sections. (e) Knurling, serrated shafts, splined shafts, and chain wheels. (f) Springs with square and flat ends, Gears, sprocket wheel (g) Countersunk & counterbore. (h) Tapers		
05	**Limits, Fits and Tolerances** 1. Characteristics of surface roughness- Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods. 2. Introduction to ISO system of tolerencing, dimensional tolerances, elements of interchangeable system, hole & shaft based system, limits, fits & allowances. Selection of fit. 3. Geometrical tolerances, tolerances of form and position and its geometric representation. 4. General welding symbols, sectional representation and symbols used in Engineering practices	**07**	
06	**Details to Assembly** 1. Introduction- 2. Couplings – Rigid flanged coupling(for Exam) & Universal couplings 3. Bearing – Foot Step Bearing (for Exam)& Plummer block 4. Lathe tool Post (for Exam) 5. joining of two rod ends: Knuckle joint(for Exam)& socket & spigot joint (for Exam) 6. Screw Jack 7. C I pulley (for Exam)& stepped cone pulley (for Exam)	**32**	
07	**Assembly to Details / component Drawing** 1. Introduction – 2. Foot Step Bearing(for Exam) 3. Lathe Tail Stock 4. Drilling Jig (for Exam) 5. Piston & connecting rod 6. Gland and Stuffing box Assembly 7. Valve – Not more than eight parts 8. Knuckle joint (for Exam)& socket & spigot joint (for Exam) 9 Spur Gear(for Exam)	**32**	
	Sub Total: Lecture & Practical Classes	105	35
	Internal Assessment examination and preparation for semester examination	14	
	Grand Total:	119	

Practical:

Skills to be developed:

Intellectual skills:

1. Understand interpenetration of solid.
2. Interpret limits, fits and tolerances on a given drawing.
3. Visualize assembly of components from given details.
4. Interpret Conventional symbols as per IS code SP46.
5. Identify different materials and their properties.

Motor Skills:

1. Draw front view and top view of solids Penetrating one with other.
2. Conventionally represent limit, fits and tolerances on a given drawing as per the manufacturing processes.

3. Give surface roughness values and symbols on a part drawing
4. Setting and use of different drawing equipments.
5. Record bill of materials in assembly drawing.

List of Practical: (Use first angle method of projection)

1. Intersection of Solids: One sheet (A0 size)
2. Development of surfaces: two sheets (A0 size) of different objects.
3. Auxiliary views: One sheet (A0 size)containing 4 problems
4. Conventional Representation as per SP – 46 (1988): – as home assignment on Sketch Book
5. Limit, Fit, Tolerances and Machining Symbols: – as home assignment on Sketch Book
6. Assembly to detailed drawings of components including Bill of Materials & conventional representation of tolerances and surface finish symbols: at least five problems on A0 size sheet + balance on Sketch Book as home assignment.
7. Details to Assembly including Bill of Materials: at least five problems on A0 size sheet + balance on Sketch Book as home assignment.

Text Books:	**Title of the Book**	**Name of Publishers**
N.D.Bhatt	Machine Drawing	Charotar Publication, Anand
N.D.Bhatt	Engineering Drawing	Charotar Publication, Anand
Bureau of Indian Standards	Engineering Drawing Practice for School and colleges : IS Code SP 46 (1988)	Bureau of Indian Standards
L.K.Narayanan, P.Kannaich, K.VenkatReddy	Production Drawing	New Age International Publication
P.S.Gill	Machine Drawing	S.K.Kataria and Sons
M.L.Dabhade	Engineering Drawing (For Topic on Auxiliary Views)	McGraw Hill
Basant Agarwal, C M Agarwal	Engineering Drawing	Tata McGraw Hill
Sidheshwar	Machine Drawing	Tata McGraw Hill
Basudev Bhattacharyya	Machine Drawing	Oxford University Press

Reference books :- Nil

Practical Sessional Examination Scheme:	
Practical Internal Sessional Continuous Evaluation **Internal Examination: Examiner-** Lecturer in Mechanical Engg. / Jr. Lecturer	
Submission of Drawing Sheet & Home assignment in scheduled time	**30**
Viva voce	**20**
Total	**50**
Practical External Sessional Examination	
Examiner for External Sessional Examination :	**Lecturer in Mechanical Engineering / Jr. Lecturer in Mechanical Engineering**

Submission of signed drawing sheet & home assignment	**30**
Viva voce	**20**
Total	**50**

SEMESTER EXAMINATION SCHEME

GROUP	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	03	10	1	10	03	01	10	25
B	4,5	05				00			
C	6,7	02				02	01	15	

7 Professional Practices-I

Name of the Course : Mechanical Engineering **Subject: Professional Practices-I** **Course)**	
Course code:	**Semester : Third**
Duration : 17 weeks	**Maximum Marks : 50**
Teaching Scheme	**Examination Scheme**
Theory : hrs/week	Internal Assessment: Marks
Tutorial: hrs/week	Teacher's Assessment (Assignment & Quiz): Marks
Practical : **2** hrs/week	End Semester Exam: Marks
Credit: **1**	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	Acquire information from different sources.
2	Prepare notes for given topic.
3	Present given topic in a seminar.
4	Interact with peers to share thoughts.
5	Prepare a report on industrial visit, expert lecture
Pre-Requisite:-Nil	

Contents		Hrs/week
Chapter	**Name of the Topic**	
	Industrial Visits Structured industrial visits be arranged and report of the same should be	5 hours

01	submitted by the individual student, to form a part of the term work. **ONE** industrial visits may be arranged in the following areas / industries : i) Manufacturing organizations for observing various manufacturing processes including heat treatment ii) Material testing laboratories in industries or reputed organizations iii) Auto workshop / Garage iv) Plastic material processing unit	
02	**Individual Assignments :** **Any two** from the list suggested a) Process sequence of any two machine components. b) Write material specifications for any two composite jobs. c) Collection of samples of different plastic material or cutting tools with properties, specifications and applications. d) Preparing models using development of surfaces. e) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable. f) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. g) List the various properties and applications of following materials – a). Ceramics b). fiber reinforcement plastics c). thermo plastic plastics d). thermo setting plastics e). rubbers.	5 hours
03	**Computer Aided Mechanical Engineering Drawing using CADD software:** **Basic screen components** – Starting a drawing: Open drawings, Create drawings– Co-ordinate systems: Absolute co-ordinate system, Relative co-ordinate system – Direct distance method – Saving a drawing: Opening an existing file **– Concept of Object – Object selection methods: Pick by box, Window selection, Crossing Selection, All, Fence, Last, Previous, Add, Remove – Erasing objects: OOPS command, UNDO / REDO commands – ZOOM command – PAN command, Panning in real time – Setting units – Object snap, running object snap mode – Drawing circles** **Module 1 DRAW COMMANDS** **Drawing of LINE, CIRCLE, ARC RECTANGLE,ELLIPSE, POLYGON, POLYLINE ,DONUT, MULTILINE etc.** **Module 2 EDITING COMMANDS** **MOVE ,COPY , OFFSET , ROTATE , SCALE , STRETCH , LENGTHEN ,TRIM , EXTEND , BREAK , CHAMFER , FILLET , ARRAY , MIRROR ,MEASURE , DIVIDE , EXPLODE , MATCHPROP , Editing with grips: PEDIT.** **Module 3 DRAWING AIDS** **Layers – Layer Properties Manager dialog box – Object Properties LTSCALE Factor , Auto Tracking ,REDRAW ,REGEN .** **Module 4 CREATING TEXT**	24 hrs

	Creating single line text – Drawing special characters – Creating multiline text – Editing text – Text style **Module 5 BASIC DIMENSIONING** **Fundamental dimensioning terms: Dimension lines, dimension text, arrowheads, extension lines, leaders, centre marks and centrelines, alternate units – Associative dimensions – Dimensioning methods – Drawing leader** **Editing dimensions by stretching – Editing dimensions by trimming & extending – Editing dimensions, Editing dimension text: , Updating dimensions ,Creating and restoring Dimension styles.** **Module 6 HATCHING** **Basics of HATCHING – Boundary Hatch Options: Quick tab, Advance tab – Hatching around Text, Traces, Attributes, Shapes and Solids – Editing Hatch Boundary.** **Module 7 PLOTTING OF DRAWINGS** **Plot Configuration – Pen Assignments – Paper Size & Orientation Area – Plot Rotation & Origin – Plotting Area – Scale** **Module 8 PRACTICE WITH COMPLETE DRAWING** **Each student is required to prepare a set of 2D drawing (handle, Hooke, wrench, gasket, orthographic projections of 1st, 2nd & 3rd Semester drawing) to practice above CADD commands and any other drawings approved by the teacher-in-charge.** Any two assembly drawing of the following**:** **1] Cotter Joint.** **2] Knuckle Joint** **3] Screw Jack.** **4] Foot step bearing.** **5] Universal Coupling** **6] Flange Coupling** **7] Tail stock** **8] Piston of SI engine.**	
	Total	34 hours

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
Sham Tickoo	Autocad 2002 with Applications		Tata Mcgraw Hill
George Omura	Mastering Autocad 2010 & Autocad LT 2010		BPB Publication
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	
Chapter	
1 – Submission of project Report on industrial visit on scheduled date	**5**
2 - submission of two assignment on scheduled date	**5**
3 – Practice of CADD software	**10**
Viva - voce	**5**
Total:	**25**
External Practical Sessional Examination	
Submission of signed report & assignment	**5**
On spot CAD Drawing	**15**
Viva voce	**5**
Total:	**25**

Name of the Course : Mechanical Engineering **Subject: Fundamentals of Electronics**	
Course code:	**Semester : Third**
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 :- In present day mechanical systems, application of electric and electronic engineering have larger role to play. For effective maintenance and operation of these components as well as circuits, mechanical engineers/ technicians must have perfect knowledge of fundamentals of electronics and digital electronics.

Objective :-

S. No.	The Students should be able to:
1.	Understand the concept of P and N types of semiconductors, know the working of electronic components like semiconductors diodes, rectifiers, filters, regulators & their operation.
2.	Understand the principle and working of semiconductor switching devices like SCRs, DIAC, TRIAC and optoelectronics devices, their working principles and applications.
3.	Understand the concept of transistor amplifier, Oscillator, and multivibrators and their application.
4.	Understand operation of signals, gates, flip-flops, encoder, decoder, counter, multiplexer used in electronic circuits

Pre-Requisite: Elementary knowledge on Physics and basic Mathematics

Contents	Hrs/week

THERMAL ENGINEERING- I

Chapter		**Name of the Topic**	**Hours**	**Marks**
		GROUP-A		
1		**Semiconductor diode** 1.1 Review of P-type and N-type semiconductor, Junction of P-type & N-type i.e. PN junction, Barrier voltage , depletion region ,Junction Capacitance 1.2 Forward biased & reversed biased junction, Diode symbol , circuit diagram for characteristics (forward & reversed) ,Characteristics of PN junction diode, Specifications:-Forward voltage drop , Reversed saturation current, maximum forward current , power dissipation 1.3 Package view of diodes of different power ratings (to be shown during practical hours) Zener diode: construction, symbol, characteristics, equivalent circuit and specifications.	05	

2		**Rectifiers, Filters and Power Supply** 2.1 Need of rectifier , definition ,Types of rectifier – Half wave rectifier, Full wave rectifier,(Bridge & centre tapped) Circuit operation 2.2 Input/output waveforms for voltage & current, Average (dc) value of current & voltage (no derivation), Ripple , ripple factor , ripple frequency , PIV of diode used , efficiency of rectifier.(no derivation only definition), Comparison of three types of rectifier 2.3 Need of filters, Types of filters, A] shunt capacitor, B] Series inductor, C] LC filter ,D] π filter --- only circuit operation (no mathematical derivation), Input/output waveforms , limitations & advantages 2.4 Voltage regulator- Simple voltage regulator circuit using zener, familirisation with IC regulator circuit (like 78XX , 79XX series etc.), IC 723 adjustable power supply 2.5 Switch mode power supply (SMPS), Block diagram of UPS, Concept of online and off line UPS. 2.6 Concept of constant current limiting and fold back current limiting, concept of constant voltage source, constant current source	10	
		GROUP-B		
3		Transistors, Switching and Optoelectronics Devices 3.1 Construction and operation of NPN and PNP transistors-V-I characteristics, transistor in active, saturation and cut-off-CE, CB, CC configuration and their differences, definitions of current gains . 3.2 Transistor Biasing -- need of biasing , types of biasing circuits Fixed biased circuit, Base biased with emitter feedback, Base biased with collector feedback and Voltage divider bias circuit- concept only 3.3 Differences between BJT and JFET, Construction, operation and VI	10	

		characteristics of JFET, pinch-off voltage, drain résistance, trans conductance, amplification factor and their relationship, Enhancement and depletion type MOSFET- concepts of CMOS 3.4 Power diode, Varactor diode, 3.5 TRIAC, DIAC, Silicon control rectifier (SCR):-Symbol, working, applications –elementary ideas , Comparison between Transistor and SCR. 3.6 Elementary ideas of LED, LCD, photodiode, phototransistor and solar cell and their applications only		
4		**Small signal amplifiers** **4.1** **C**oncept of amplification----Small signal amplifier using BJT, Determination of current , voltage & power gain ,Input & output resistance , phase shift between input & output.AC Load Line, Function of input & output coupling capacitors Function of emitter bypass capacitor . 4.2 AC equivalent circuit of transistor CE amplifier, Single stage CE amplifier with voltage divider bias. Its explanation. Frequency response of single stage CE Amplifier, Bel and Decibel unit. Bandwidth & its significance. 4.3 Cascade Amplifiers (Multistage Amplifier), Need of Multistage Amplifiers, Gain of amplifier 4.4 Types of amplifier coupling – RC, transformer & Direct coupling. 4.5 Two stage amplifier circuit diagram , working, frequency response , merits & demerits & applications of each	05	
GROUP-C				
		Oscillator 5.1 Oscillator – Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram and its application-. Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator.	05	

		5.2 OP Amp Block diagram, configurations and use of op amp as - Inverting, non inverting, Summing amplifier, Voltage to current converter, current to voltage converter, differentiator,Comparator, Wien bridge oscillator, Schmitt's trigger, Instrument amplifier		
		DIGITAL ELECTRONICS 6.1Define analog signal and digital signal 6.2 Study of logic gates(NOT,OR, NOR, AND, NAND) symbols and truth table ,Flip Flop Study of flip flops : only RS (using NAND gate) & D Flip flop , symbols and truth table 6.3 Working principle with block/ logic diagram of encoder & decoder Working principle with block/logic diagram of Multiplexer (4:1) and demultiplexer (1:4) Working of seven segment display 6.4 Working principle with General block diagram of shift register & counter- elementary ideas	05	
		IC 555 7.1 Block diagram, Multi vibrator circuit diagram and working for Mono stable, Bi stable and Astable Multivibrator, 7.2 Block diagram and working of – Welding control circuits – sequential timer 7.3 Temperature control circuits using SCR, FWR, Speed control circuits 7.4 Level control circuit using variable capacitor and potentiometer.	05	
		Sub Total:	45	

REFERENCE BOOKS

1. Electronic devices & Circuit Theory / Boylestad & Nashalsky / Pearson Education
2. Electronic devices & circuits/ AK Maini/ Willey
3. Electronics Devices and Circuits/ David A. Bell/ Oxford Unversity press
4. Electronic Devices / Dr. Sanjay Sharma, / S.K. Kataria and sons
5. Electronic Principle / A.P. Malvino / Tata McGraw-Hill
6. Electronic Devices & Circuits / Millman & Halkias / Tata McGraw-Hill
7. Basic Electronics & Linear Circuits / Bhargava / Tata McGraw-Hill

8. Electronic Fundamentals & Applications / D. Chattopadhyay & P.C. Rakhshit / New Age International
9. Linear Integrated Circuit/ Ganesh Babu/ SCITECH publications
10. Electronic Components and Materials / Madhuri A Joshi / Wheeler Publishers
11. Digital Electronics/ G K Kharate/ OXFORD
12. Digital Electronics / R Raja /SCITECH PUBLICATION
13. Digital Electronics/ Anil K. Maini/ Wiley
14. Digital Logic and Computer Design/ Morris Mano/ Pearson

Fundamental of Electronics Lab

Subject Code	Course offered in	Course Duration	Full Marks
AE / 3 / S2 / LFOE	Part – II 1st Semester	17 weeks	50

CONTACT PERIODS	INTERNAL ASSESSMENT	TOTAL
30 @ 2 sessional contact periods per week for 15 weeks	6 periods	30 periods

O B J E C T I V E

On satisfactory completion of the course, the students should be in a position to develop the skills corresponding to the knowledge acquired in the theoretical subject Fundamenta of ELECTRONICS.

E X A M I N A T I O N S C H E M E

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Second Year First Semester. **Distribution of marks: Performance of Job – 15, Notebook – 10.**
2. **External Assessment of 25 marks** shall be held at the end of the Second Year First Semester on the entire syllabus. One job per student from any one of the jobs done is to be performed. Job is to be set by lottery system. **Distribution of marks: On spot job – 15, Viva-voce – 10.**

D E T A I L C O U R S E C O N T E N T

1. To be familiar with the common assembly tools.
2. To be able to identify and test the following passive and active circuit elements: Resistor, capacitor, inductor, transformer, relay, switches, batteries/cells, diode, transistors, SCR, DIAC, TRIAC, LED, LCD, photodiode, phototransistors, Ics etc.
3. To be familiar with the following basic instruments**:** Multimeter, oscilloscope, power supply and function generator.
4. To practice soldering , desoldering and construct & test a battery eliminator and simple regulator circuit using Zener and ICs on a Bread Board and Vero Board.
5. Input & output characteristics of transistor in CE mode

6. To study VI characteristics of FET and MOSFET
7. To study VI characteristics of SCR and UJT
8. To determine frequency response characteristics of RC coupled amplifier circuit and calculation of bandwidth, midband gain, input impedance and output impedance for **:**
   a) Single-stage amplifier, b) Double-stage amplifier
9. Study Astable and Monostable Multivibrator using IC 555
10. Study simple applications of OP AMP as summer,
11. Verify truth tables for logic gates- . NOT, AND, OR, NAND, NOR.