SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN ENGINEERING
BRANCH: MECHANICAL
GRADING SYSTEM
III SEM / II YEAR

Implemented w.e.f. July -2015

COURSE CODE	COURSE TITLE	PAPER CODE	THEORY COMPONENT								PRACTICAL COMPONENT						TOTAL CREDIT	GRAND TOTAL OF MARKS
			LECTURES	CONTINUOUS VALUATION			END OF THE TERM/SEMESTER VALUATION			THEORY CREDIT	PRACTICAL Hrs. PER WEEK	CONTINUOUS VALUATION	END OF THE TERM/SEMESTER VALUATION			PRACTICAL CREDIT		
			Hrs. PER WEEK	TERM WORK,QUIZ ASSIGNMENT	MID TERM TEST (TWO)		THEORY PAPER					LAB WORK QUIZ ,ASSIGNMENT	PRACTICAL/ORAL EXAMINATION (VIVA)					
					I	II	NO.	MARKS	DURATION (Hrs.)				NO.	MARKS	DURATION (Hrs.)			
301	MATERIAL TECHNOLOGY	6150	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
302	MANUFACTURING PROCESSES	6151	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
303	BASIC ELECTRICAL & ELECTRONICS	6030	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
304	MECHANICAL DRAFTING & AUTO CAD	6152	06	10	10	10	01	70	03	06	-	-	-	-	-	-	06	100
305	STRENGTH OF MATERIAL	6153	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
306	PROFESSIONAL ACTIVITIES										02							
	TOTAL		22	50	50	50		350		22	10	80		120		04	26	700

THEORY CREDIT S	: 22
PRACTICAL CREDITS	: 04

THEORY MARKS	: 350
PRACTICAL MARKS	: 120
QUIZ,MID TERM,LABWORK	: 230

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN ENGINEERING
BRANCH: MECHANICAL
GRADING SYSTEM
IV SEM / II YEAR

Implemented w.e.f. July -2015

COURSE CODE	COURSE TITLE	PAPER CODE	THEORY COMPONENT								PRACTICAL COMPONENT						TOTAL CREDIT	GRAND TOTAL OF MARKS
			LECTURES	CONTINUOUS VALUATION		END OF THE TERM/SEMESTER VALUATION			THEORY CREDIT		PRACTICAL Hrs. PER WEEK	CONTINUOUS VALUATION	END OF THE TERM/SEMESTER VALUATION			PRACTICAL CREDIT		
			Hrs. PER WEEK	TERM WORK,QUIZ ASSIGNMENT	MID TERM TEST (TWO)		THEORY PAPER					LAB WORK QUIZ ,ASSIGNMENT	PRACTICAL/ORAL EXAMINATION (VIVA)					
					I	II	NO.	MARKS	DURATION (Hrs.)				NO.	MARKS	DURATION (Hrs.)			
401	FLUID MECHANICS AND HYDRAULIC MACHINE	6154	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
402	THERMAL ENGINEERING	6155	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
403	THEORY OF MACHINES	6156	04	10	10	10	01	70	03	04	02	20	01	30	03	01	05	150
404	INDUSTRIAL MANAGEMENT	4100	05	10	10	10	01	70	03	05							05	100
411/ 412	OPTIONAL (ANY ONE) ENTREPRENEURSHIP/ MARKETING	4200/ 4300	06	10	10	10	01	70	03	06							06	100
406	PROFESSIONAL ACTIVITIES	…	….	…	…	…	…	…	…	…	02	…	…	…	…	…	…	..
	TOTAL		23	50	50	50	05	350		23	08	60		90		03	26	650

THEORY CREDIT S	: 23
PRACTICAL CREDITS	: 03

THEORY MARKS	: 350
PRACTICAL MARKS	: 90
QUIZ,MID TERM,LABWORK	: 210

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN ENGINEERING
BRANCH: MECHANICAL
GRADING SYSTEM
V SEM / III YEAR

Implemented w.e.f. July -2015

COURSE CODE	COURSE TITLE	PAPER CODE	THEORY COMPONENT								PRACTICAL COMPONENT						TOTAL CREDIT	GRAND TOTAL OF MARKS
			LECTURES	CONTINUOUS VALUATION			END OF THE TERM/SEMESTER VALUATION			THEORY CREDIT	PRACTICAL Hrs. PER WEEK	CONTINUOUS VALUATION	END OF THE TERM/SEMESTER VALUATION			PRCAL CREDITACTI		
			Hrs. PER WEEK	TERM WORK,QUIZ ASSIGNMENT	MID TERM TEST (TWO)		THEORY PAPER					LAB WORK QUIZ ASSIGNMENT	PRACTICAL/ORAL EXAMINATION (VIVA)					
					I	II	NO.	MARKS	DURATION (Hrs.)				NO.	MARKS	DURATION (Hrs.)			
501	Process Planning, Estimating & costing	4400	06	10	10	10	01	70	3	06							06	100
502	Machine Tool Technology	6158	04	10	10	10	01	70	3	04	02	20	1	30	3	01	05	150
503	Engineering Measurements and Maintenance Practices	6159	04	10	10	10	01	70	3	04	02	20	1	30	3	01	05	150
504	Modern Practices in Manufacturing and Management	6160	04	10	10	10	01	70	3	04	02	20	1	30	3	01	05	150
505	Industrial Engineering	6161	04	10	10	10	01	70	3	04	02	20	1	30	3	01	05	150
506	Professional Activities										02							
	TOTAL		22	50	50	50	05	350		22	20	80		120		04	26	700

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN ENGINEERING
BRANCH: MECHANICAL
GRADING SYSTEM
VI SEM / III YEAR

Implemented w.e.f. July -2015

COURSE CODE	COURSE TITLE	PAPER CODE	THEORY COMPONENT								PRACTICAL COMPONENT						TOTAL CREDIT	GRAND TOTAL OF MARKS
			LECTURES	CONTINUOUS VALUATION		END OF THE TERM/SEMESTER VALUATION			THEORY CREDIT		CONTINUOUS VALUATION	END OF THE TERM/SEMESTER VALUATION			PRACTICAL CREDIT			
			Hrs. PER WEEK	TERM WORK,QUIZ ASSIGNMENT	MID TERM TEST (TWO)		THEORY PAPER				PRACTICAL Hrs. PER WEEK	LAB WORK QUIZ ,ASSIGNMENT	PRACTICAL/ORAL EXAMINATION (VIVA)					
					I	II	NO.	MARKS	DURATION (Hrs.)				NO.	MARKS	DURATION (Hrs.)			
601	DESIGN OF MACHINE ELEMENT	6162	04	10	10	10	01	70	03	04							04	100
611/612	OPTIONAL (ANY ONE) AUTOMOBILE ENGG./CAD/CAM	6163/6164	04	10	10	10	01	70	03	04	04	20	01	30	03	02	06	150
621/622	OPTIONAL (ANY ONE) REFRIGERATION & AIR COND./POWER PLANT ENGG.	6165/6166	04	10	10	10	01	70	03	04	04	20	01	30	03	02	06	150
604	PROJECT	….	….	….	….	….	….	….	....	….	10	100	…	200	….	10	10	300
605	PROFESSIONAL ACTIVITY	…	…	…	…	…	…	…	…	…	02	…	…	…	…	…	…	…
	TOTAL		12	30	30	30	03	210		12	20	140		260		14	26	700

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

CURRICULUM
FOR

DIPLOMA IN MECHANICAL ENGINEERING

(THIRD SEMESTER)

Implemented from session 2015-16

Under semester system

MECHANICAL ENGINEERING DEPARTMENT

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **301**
NAME OF THE COURSE: **MATERIALS TECHNOLOGY** PAPER CODE:6150

COURSE CONTENTS

S.NO	COURSE CONTENTS
1	**Requirement of Engineering materials, mechanical properties and their testing** : Introduction to engineering materials, classification of engineering materials and their properties. Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.
2	**Structure of Solid materials**: Classification amorphous and crystalline states, unit cells and crystal structure (B.C.C., F.C.C. and H.C.P) allotropy. Crystal imperfection and their effects on properties
3	**Solidification of Metal and ingot structure**: Process of nucleation and grain growth, ingot solidification, dendritic and columnar structure, segregation of impurities, grain and grain boundaries.
4	**Equilibrium Phase Diagrams and Phase Transformation** : Equilibrium of phase Diagrams : Plotting of equilibrium diagrams, interpretation, phase rule and lever rule and its application Phase transformations – Eutectic Eutectoid, Peritectic and Peritectoid
5	**Practical Metallography** : Preparation of specimen, selecting the specimen, mounting the specimen, grinding , polishing, etching and etching reagents. The metallurgical microscope. Use and care of microscope.
6	**Iron- Carbon Equlibrium System** : The complete iron carbon diagram and its interpretation. The solidification and cooling of various carbon steels, structures produced, correlation of mechanical properties with carbon content.

S.NO	COURSE CONTENTS
7	**Heat Treatment of Steels**: Objective of heat treatment, thermal processes- annealing, normalizing, hardening and tempering. Hardening process : Surface hardening, flame hardening, case hardening methods, their scope, limitations and advantages, quenching mediums and their effect on hardness, Hardening defects due to improper quenching, hardenability, Jominy end quench test and interpretation of its results. T.T.T. curves interpretation and use, Isothermal heat treatment processes -martempering, austempering, spherodising and patenting
8	**Ferrous Metals and Alloys** : Classification, types of cast irons their properties and uses, alloy cast-irons, various alloying elements used, their effects on properties and uses. Classification, composition and uses of plain carbon steels, effect of impurities, Alloy steels -various alloying elements, their effects on properties and uses. Alloy steel classification.Tool Steel : Typical compositions, requirements of tool steels, high speed steel, high carbon steel. Standardization of steels. Designation of steals as per B.I.S. codes.
9	**Non- Ferrous Metals and Alloys** : Copper : Its Properties and uses Cooper Bases Alloys : Brasses, their classification, composition, properties and uses, designation of copper alloys as per B.I.S. aluminum its properties and uses. Aluminum Alloys : Their composition, Classification, properties and uses. Designation of Al- alloys as per B.I.S, Zinc, Nickel and lead their alloys properties and uses Bearing alloys - their composition and field of application.
10	**Non- Metallic Materials** : introduction to Ceramic Refractory, Rubbers Insulators and Lubricants

S.NO	COURSE CONTENTS
11	**Plastics**: characteristics, classification, commonly used thermo-setting and thermoplastic - their properties and uses. Ingredients for processing plastics. Plastic processing methods different methods.
12	**Powder Metallurgy:-**Introduction and application. Description of process, manufacture and blending of metal powder compacting and sintering.
13	**Metal Preservation**: Corrosion meaning various mechanism effect of corrosion, methods of minimizing corrosion
14	**Modern Trends in Materials Engineering** : New materials like FRP, Composites, synthetic fibers, synthetic wood. Super conductors

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **301**
NAME OF THE COURSE: **MATERIALS TECHNOLOGY** PAPER CODE:**6150**

LIST OF EXPERIMENTS

S.No.	NAME OF EXPERIMENT
1	Preparation of micro specimen.
2	To study micro structural characteristics of gray cast iron white cast iron and malleable cast iron.
3	To study effect of normalising, annealing on the hardness and microstructure of high carbon steel.
4	To study the effect of carbon and temperature on hardening of steel.
5	To study the effect of temperature on the properties during tempering of steel.
6	To study the effect of quenching media on hardness of steel.
7	To study the carbonizing and case hardening of steel.
8	Joining hardenability test and its industrial use.
9	To Study the microstructure of some important brasses and bornzes.
10	To observe the micro structural characteristics and other properties of various cast irons and prepare a report there of, for industrial uses.

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **301**
NAME OF THE COURSE: **MATERIALS TECHNOLOGY** PAPER CODE:6150

REFERENCES

1 Engineering physical Matallurgy-By Prof. Y Lakhtin MIR Publishers mascow
2 A Text Book of Material Science And Metallurgy by O.P. Khanna.
3 Material Science And Process. by S. K. Hazia Choudhry
4 Mechanical Metallurgy by Dieter (Tata Mcgrawhill)
5 Materials For Engineers by M.H.A. Kempsty
6 Introduction to Material Science And Engineeringby K.M. Ralls, T.H. Courtney, John Wuff (Wiley Eastern New Delhi)
7 Physical Matallurgy Principles by Read Hill (Affiliated East- West Press Pvt. Ltd. New Delhi.)
8 Engineering Metallurgy by R. Higgins (ENS).
9 Materials Science by B.S. Narang (Pub. CBS pub. & Distributions New Delhi)
10 Padarth Prodyogiki (Hindi) by P.N. Vijayvergiya (Deepak Prakashan, Gwalior) .

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **302**
NAME OF THE COURSE: **MANUFACTURING PROCESSES** **PAPER CODE:6151**

COURSE CONTENTS

S.NO	COURSE CONTENTS
1	**Introduction to Manufacturing Processes :** Definition, classification of basic manufacturing processes i,e, mechanical working, casting, metal joining processes, metal cutting process, press working . Examples of each of the above listed manufacturing processes, factors which influence selection of manufacturing process for a particular application.
2	**Metal Casting** : Introduction , advantages and limitations of casting as production process. **Pattern Making** : Definition of pattern, types of patterns and their details, materials, allowances, tools required, colour code for patterns. **Moulding** : Definition, moulding methods and types of moulds, moulding materials, moulding sand and its composition, sand properties, testing parameters of sand, and their effects, sand preparations, sand conditioning, characteristics and defects of moulds. Function of runners, risers and gate. Cores and core making, core boxes. Cleaning of casting, Special casting methods, need for special casting methods, die casting, centrifugal casting, investment (lost wax) casting, casting defects, causes and analysis, area of application of casting process. Furnaces : Cupola ,crucible, pit and electric arc furnaces, induction furnace , their salient features, safety aspects.

S.NO	COURSE CONTENTS
3	**Press Working** : Introduction of press working of metals, principle of press working , description of a simple press working unit, press working operations : punching, shearing, drawing, bending, slitting, knurling, notching, trimming, piercing etc. Double action press, description and its field of application, die and punch, types of dies, specifications of a press, safety precautions to be observed while working on a press.
4	**Mechanical Working** : Introduction - hot and cold working Principle of recrystalization. **Metal Rolling** : Principle of metal rolling , basic components of a simple rolling process equipment. Types of deformation during rolling. roller material, selection and desirable properties, principles of thread rolling- description with sketches, manufacture of seamless tubes by rolling. types of rolling mill. Rolling defects **Metal Drawing** : Basic Principle of drawing of metals, differentiate between the drawing and deep drawing of metals, principle of wire drawing and example. **Extrusion** : Definition, Classify the methods of extrusion, their limitations, advantage and disadvantage. Tube extrusion, impact extrusion, application of extrusion processes. Extrusion defects . **Forging** : Types of forging, Die forging, differentiate between the cold die and hot die forging , advantage of forming by forging, common defects and their reasons. Limitations of forging, press forging, drop forging, upset forging, die material , applications of forging processes in engineering.

S.NO	COURSE CONTENTS
5	**Metal Joining** : Introduction, Classification of metal joining processes **Welding** :-classification, Plastic, fusion and forge welding, Weldability of metals, metallurgy of welding **Resistance welding** : Spot, seam, butt, projection, percussion techniques. **Gas welding and gas cutting** : Principle of operation and technique, gas cutting. **Arc Welding** : Carbon arc, TIG, MIG, Submerged arc , Atomic hydrogen, Eletro-slag, Plasma arc welding processes, Electrodes-types and selection , flux and their uses. Special welding techniques-Welding of different metals. Defects in welds, testing and inspection. Accident prevention in gas and arc welding Equipments & tools used in metal arc welding, specification and functions. Soldering, Brazing and Adhesive bonding

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **302**
NAME OF THE COURSE: **MANUFACTURING PROCESSES** **PAPER CODE:6151**

LIST OF EXPERIMENTS

S.No.	NAME OF EXPERIMENT	SHOP
1	Making a split/solid pattern from wood. Making a core box.	Carpentry /pattern shop
2	Tempering of sand, practice of green and dry sand making.	pattern shop
3	Practice of core making and baking	Moulding shop
4	Practice of open mould in a two boxes, using split pattern and solid pattern, Locating the core .	Moulding shop
5	Demonstration of metal melting in pit furnace& casting process.	foundary
6	Simple forming practice (Making a square bar out of a given round bar, making of a chisel and bolt)	Blacksmith shop
7	Practice of upsetting of a round on power hammer.	Blacksmith shop
8	Practice of sheet cutting with the help of straight and bent snips. Making small rectangular prism and cylinder.	Blacksmith shop Tinsmith
9	Practice of making of washer of any size on a flypress.	Blacksmith shop Tinsmith
10	Practice of piercing, notching and circle cutting with the help of Metal master machine.	Blacksmith shop Tinsmith

S.No.	NAME OF EXPERIMENT	SHOP
11	Practice of piercing, notching and circle cutting with the help of Metal master machine.	Blacksmith shop Tinsmith
12	Practice of piercing, notching and circle cutting with the help of Metal master machine.	Blacksmith shop Tinsmith
13	Practice of edge preparation for welding.	Fitting
14	Demonstration and practice of bead laying (Welding) on a Flat pieces	Fitting
15	Practice of Welding of corner, edge and Tee joint	Welding
16	Welding ' V' butt joint.	Welding
17	Practice of joining wires and rods of different size on spot welding machine.	Welding
18	Practice of making gas flames with nozzles and making simple joints.	Welding

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **302**
NAME OF THE COURSE: **MANUFACTURING PROCESSES** **PAPER CODE:6151**

REFERENCES

1. Process And Materials of Manufacture by Lindberg.
2. Workshop Technology by Hazara & Choudhary.
3. Materials And Manufacturing process by Dalela.
4. Manufacturing Processes by Yankee.
5. Manufacturing Process by S.E. Rusinof
6. Welding Engineering by B.E. Rossi.
7. Production Engineering – P.C. Sharma
8. Manufacturing Technology- P.N. Rao
9. Production Technology- R.K. Jain
10. Foundry Engineering by P.L. jain.
11. Nirman Prakram (Hindi) by P.N. Vijayvargiya. (Deepak Prakashan, Morar, Gwalior)

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **303**
NAME OF THE COURSE: **BASIC**
ELECTRICAL AND ELECTRONICS PAPER CODE:6030

COURSE CONTENTS

S. NO.	COURSE CONTENTS
1	.FUNDAMENTALS OF ELECTRICAL ENGINEERING 1.1 Concept of electric current, potential and potential difference (Voltage). 1.2 Sources of D.C. and A.C. Electric energy. 1.3 Methods of voltage generation and standard voltages used in generation transmission and distribution. 1.4 Electrical Power, energy and their units.
2.	D.C. CIRCUITS 2.1 Ohm's Law, Concept of resistance, conductance, resistivity, conductivity and their units. Effect of temp. on resistance. Temperature coefficient of resistance (Definition only) 2.2 Connections of resistances. Series, Parallel connections and their combinations. (Simple Numericals) 2.3 Kirchoff's Voltage Law, Kirchoff's Current Law (Simple Numerical)
3.	A.C. CIRCUITS 3.1 Generation of single phase and three phase sinusoidal voltage. Vector representation. Concept of Cycle, Frequency, time period, amplitude, phase and phase difference. 3.2 Define instantaneous value, average value, RMS value and peak value of sinusoidal electrical quantities. Derive relationship between them . Form factor and peak factor (Definition only). 3.3 Current voltage and power in pure resistive, inductive and capacitive circuit. 3.4 Concept of Reactance , impedance and power factor in R.L., R. C. and RLC Series circuit. (Simple Numericals). 3.5 Causes and effect of poor power factor. Methods of improving power factor. 3.6 3 phase AC supply- three phase three wire and three phase four wire system. Relationship between V_L and V_{PH}, I_L and I_{PH} and three phase power in star and delta connected load.(Simple Numerical)

4.	D.C. MACHINES 4.1 Review of concept of Electromagnetism and related laws (Faraday's Law, Lenz's Law, Cork Screw Rule, Fleming's Left Hand & Right Hand Rule.) 4.2 Construction of D.C. Machines, its main parts and their functions. Classification of D.C. Machines. 4.3 D.C. Generator : Principle , EMF equation(Derivation and simple numerical), Types of D.C. Generator (No Numerical), Applications of DC generator. 4.4 D.C. Motor : Working Principle of DC motor, Types of DC motor, significance of back emf, Torque equation(No Numerical). 4.5 Characteristics of D.C. Series and Shunt Motor. Applications of D.C. Motor. D.C. Motor starter - 3 point starter. Efficiency (No numerical)
5.	A.C. MACHINES 5.1 Single Phase Transformer : Construction, working principle. 5.2 EMF Equation (Derivation with simple numerical), Turn ratio, Step up and step down transformers and their application. 5.3 Losses , efficiency and regulation (No derivation). 5.4 Three Phase Induction Motor : Construction, types , principle of operation. Concept of Slip (Simple Numerical), Applications, Starters: DOL and Star Delta. 5.5 Single Phase Induction Motor : Methods of making a single phase motor self start. Types of single phase induction motor- capacitor start, capacitor run and shaded pole and their applications. 5.6 Synchronous Machines : Synchronous motor- construction, principle of operation, comparision with three phase induction motor. Synchronous generator (alternator) – Construction, principle of operation, speed and frequency, synchronous speed.
6	.MEASURING INSTRUMENTS AND TRANSDUCERS 6.1 Classification of Measuring Instruments, absolute and secondary instruments. Indicating, Integrating and Recording instruments, their examples. 6.2 Elementary idea about working principles and construction of MI and MC type Ammeter and voltmeter. Electrodynamometer type watt meter. Induction type energy meter , electronic energy meter. Application of Megger and earth tester.Multimeter, CRO, its block diagram and applications. 6.3 Transducers – Definition, primary and secondary transducers, active and passive transducers, variable parameter R,L,C type transducers. 6.4 General idea about strain gauge, LVDT, Thermocouple, Peizo Electric and Photoelectric Transducers.
7.	ELECTRIC WIRING 7.1 Types of Wiring and their Applications. 7.2 Size of conductor , S.W. gauge. Accessories like switches, fuses, holders, sockets and MCB's. 7.3 Staircase Wiring , Fluorescent tube light wiring .

8.	ELECTRONIC DEVICES AND CIRCUITS 8.1 Semiconductor PN Junction Diode, Zener Diode, PNP and NPN transistor , UJT, FET, MOSFET and SCR. Their layer diagram, symbol, V-I characteristics and applications. 8.2 Electronic Circuits : Concept of biasing of diode and transistor. 8.3 Single Phase Half wave and Full wave rectifier(I/O waveform), Concept of ripple, filter circuit (shunt capacitor and series inductor) . Transistor as an amplifier, concept of gain, Zener regulator, regulated power supply (Block diagram only).
9.	ELECTRIC SAFETY 9.1 Electric shock and its prevention , effect of electrical current on human body, shock treatment, need of earthing.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **303**
NAME OF THE COURSE: **BASIC ELECTRICAL AND ELECTRONICS**
PAPER CODE:6030

LIST OF EXPERIMENTS

S. NO.	NAME OF EXPERIMENT
1.	Verification of Kirchoff's Law
2.	To Measure Voltage Current and power in single phase AC circuit.
3.	To calculate Impedance, power and power factor by measuring voltage across each element and current to the circuit for a given RLC series
4.	circuit.
5.	Study of different parts of DC machine .
6.	Study of three point starter for DC motor.
7.	To determine transformation ratio of a given single phase transformer.
8.	Study and operation of DOL and Star Delta Starter.
9.	To measure slip for a given three phase induction motor.
10.	To measure insulation resistance by Megger.
11.	To measure earth resistance by earth tester.
12.	To measure linear displacement by LVDT.
13.	To make connection for stair case wiring.
14.	To make connection for fluorescent tube light circuit.
15.	Testing of various electronic components using multimeter and CRO.
16.	To draw V-I characteristics of Zener diode.
17.	To observe input and output wave form of full wave / half wave rectifier on CRO. To observe amplified output of a given amplifier. NOTE : The list of the experiment given above, the student has to perform atleast 12 experiment.

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **303**
NAME OF THE COURSE: **BASIC ELECTRICAL AND ELECTRONICS**
PAPER CODE:6030

REFERENCES

1. Fundamental of Electrical Engineering and Electronics – B.L. Thareja , S. CHAND Publication
2. Basic Electrical Engineering – V.K. Mehta , S. CHAND Publication
3. Principles of Electronics – V.K. Mehta , S. CHAND Publication
4. Basic Electrical Engineering – V. N. Mittle, TMH
5. Electrical Machines Vol I & II – S.K.Bhattacharya, TTTI, Chandigarh
6. A Curse book in Electrical & Electronic Measurement and Instrumentation , A.K. Sawhney.
7. Principles of Electrical Engg. and Electronics – V.K. Mehta , S. CHAND Publication
8. Electrical Technology – S.L.Uppal, Khanna Publication
9. ELectrical Measurement – J.B. Gupta, Dhanpat Rai & Sons.

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **304**
NAME OF THE COURSE: **MECHANICAL**
DRAFTING AND AUTOCAD PAPER CODE:**6152**

COURSE CONTENTS

S.NO	COURSE CONTENTS
1	**Projection and multi view Representation**: Projection orthographic projection. First and third angle projection, superfluous view, choice of views, auxillary views- views -full and partial, conversion of pictorial views in to orthographic views, conventional representation as per IS: 696.
2	**Sectional Views** : Full section, half section, partial or broken section, revolved section, removed section, offset section. Sectioning conventions, section lines. Hatching procedure for different materials as per IS code 686 1972. Sectional views of assembled parts. Choosing from IC engine parts, couplings, clutches, brackets, bearing etc. (Use 1st and 3rd angle projections both)
3	**Dimensioning Tolerance, Machining And Welding Symbols** : Types of dimensions (size and location) dimensioning terms and notations. (use of I.S.Code 696 &2709) general rules for dimensioning and practical hints on dimensioning systems of dimensioning. Dimension of cylinder holes arcs of circle narrow space, angles, counter sunk hole, screw threads taper etc. Application of tolerances. (Use I.S. Code 696) Machining marks, finish marks, countersinking, counter boring spot facing, figures and notes for same. Representation of characteristics machining (circularity, Angularity etc .) (Ref IS 969) Representation of welded joints, welding symbols, tolerance of forms and positions. Procedure of drawing fits, limits, size, tolerance, clearance etc.

S.NO	COURSE CONTENTS
4	**Production Drawing**: Detailed drawing, assembly drawing, scale, finish tolerances, notes etc. Title block, tool list, gauge list. Preparation of production drawing for pattern shop. Forging shop, machine shop, preparation of assembly drawing from detailed drawing. exploded views, sectional pictorial views, assembly drawing of nut and bolt, plummer block, flange coupling, stepped pulleys, foot-step bearing, Universal coupling, connecting rod, piston of I.C. engines, cotter joint, Knuckle joint. Preparation of detailed drawing from assembly drawings and assembled pictorial views, Interpretation of production drawing.
5	**Introduction to Auto CAD**: Coordinate system. Draw command-line ,arc, circle rectangle, polygon, point, ellipse, hatch, table. Modify commands-erase, copy, offset, array, trim, extend, break, join, chamfer, fillet, move, rotate, scale, stretch, lengthen. Dimensioning Tray settings: snap, grid, ortho, polar, osnap Format commands: line type, point style, units, layers, drawing limit, dimension style
6	**Application of Auto CAD**: practice of assembly drawings using Auto CAD
7	**Presentation**: Block, creating layout, insert layout ,ploting/printing
8	**Pipe Drafting** : Various symbols used in pipe line work as per IS code of Practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fitting typical pipe bends, pipe supports and accessories.
9	**Gear Drawing** : Gear terminology such as pitch, pitch circle diameter module, addendum, root circle diameter, hole depth, blank diameter etc. construction of cycloidal, involute teeth profiles, pinion and rack mashing, spur gear mashing.

S.NO	COURSE CONTENTS
10	**Graph and Charts** : Introduction, Classification of chart, graphs and diagrams, quantitative and qualitative charts and graphs, Drawing and curve titles, legends notes etc. procedure for making a graphical representation in ink. Logarithmic graphs, semi logarithmic graphs, bar charts area (Percentage) charts, pie chart, alignment charts (Nomo graphs) Forms and construction, construction of functional scale, parallel scale charts for equations of the form [redacted] f (t) +f(u) +f (v), (f (t[redacted]f (u) = f (v) [redacted] three scale alignment chart, graphical construction of a Z- chart, four variable relationship parallel scale alignment chart.

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **304**
NAME OF THE COURSE: **MECHANICAL**
DRAFTING AND AUTOCAD PAPER CODE:**6152**

SUGGESTED TERMS –WORK

S.No.	TOPIC
1	Projection and multi views representation
2	Sectional views
3	Dimensioning, tolerance, machining and welding symbols
4	Production drawing
5	Pipe drafting
6	Gear Drawing
7	Graphs and charts
8	Computer graphics

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **304**
NAME OF THE COURSE: **MECHANICAL DRAFTING AND AUTOCAD** PAPER CODE:**6152**

REFERENCES

1 Fundamentals of Engineering Drawing by Warren J. Luzadder (Prentice-Hall).
2 Machanical Drawing by Giesecke, Mic- hell Specer, Hill. (Collier Macmillan Internal Edition)
3 Engineering Graphics by Giesecke/Mitchell/ Spencer/ Hill/ Loving (Macmillan) .
4 Mechanical Drawing By N.D.Bhatt
5 Mechanical Drawing By P.S.Gill
6 Mechanical Drawing By R.K.Dhawan
7 Inside AUTO CAD by Daniel Raker and Harbest Rice(BPB Publisher)
8 Computer Graphics and CAD Fundamentals By Noel M Morries(Wheeler)

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **305**
NAME OF THE COURSE: **STRENGTH OF MATERIALS** PAPER CODE:6153

COURSE CONTENTS

S.NO	COURSE CONTENTS
1	**Simple Stress and Strains** : Introduction types of loads and deformation, types of stresses and strain. Hooke's law, stress strain diagram for ferrous and non ferrous materials modulus of elasticity. rigidity and bulk modules of materials Stress in bars of varying cross sections, composite sections and compound sections Thermal stresses and strains, thermal stresses in composite sections. Poisson's ratio, volumetric strain, relation between different modulus, strain energy, resilience, proof resilience, modules of resilience suddenly applied loads and impact loads.
2	**Mechanical properties and their testing** : Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, torsion test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.
3	**S.F. and B.M. Diagrams** : Definition, types of loading types of beams, shear force and bending moment sign conventions S.F. and B.M. diagrams for cantilever simply supported and overhanging beams with point or concentrated loads uniformly distributed loads and combination of point and U.D.L. Point of contra flexure, numerical problems.
4	**Principal Planes and Principal Stresses** : Stresses on inclined plane subjected to direct shear or combination of stresses in two mutually perpendicular planes. Principal planes and principal stresses, analytical and graphical methods.
5	**Bending Stresses in Beams** : Theory of simple bending as assumptions made in simple bending theory position of neutral axis, surface moment or resistance. Modules of section of symmetrical sections such as rectangular, circular and I sections, bending stresses in symmetrical sections. Simple problems. Reinforced concrete beams, beam of uniform strength.

S.NO	COURSE CONTENTS
6	**Shear Stresses in Beams.:** Introduction shear stress equation, assumptions made, distribution of shear stresses over various sections, such as rectangular, circular and I L & T sections, Simple numerical problems.
7	**Deflection of Beams** : Introduction Strength and stiffness of beam curvature of bent beam, Derivation of equation for slope and deflection of beam in case of cantilever and simply supported beam loaded with point loads U.D.L. and combination. Simple numerical problems. Importance of deflection and practical applications.
8	**Torsion of Shaft** : Definition of torsion relation between stress, strain and angle of twist assumptions made strength of solid and hollow circular shaft, polar moment of inertia. Calculation of shaft diameter on the basis of strength and stiffness for the given horse power transmitted torsional rigidity. Maximum torque comparison of solid and hollow shaft size of a shaft for a given torque.
9	**Spring** : Definition types and use of springs, leaf spring, helical and spiral springs, Stiffness of a spring and maximum shear stress, defection of spring . Spring Classification based on size shape and load.
10	**Columns and struts** :Definitions crippling load different end conditions, slenderness ratio, equivalent length, Euler's theory Rankine's formulae, radius of gyration, Rankine constant for different materials Limitations of Rankine formula simple problem B.I.S. code for columns.
11	**Stresses in Frames** : Definition of frame, perfect, deficient and redundant frame. Assumptions made in finding stress in method of sections and graphical method Bows notation, solution of problems using three methods.

S.NO	COURSE CONTENTS
12	**Thin Cylinders and Spheres** : Hoop stress longitudinal stress on inclined plane subject subjected to direct, shell, volume strain change in value, cylindrical vessels subjected to internal pressure, simple numerical problems.

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **305**
NAME OF THE COURSE: **STRENGTH OF MATERIALS** PAPER CODE:6153

LIST OF EXPERIMENTS

S.No.	NAME OF EXPERIMENT
01	Study and demonstration of Universal Testing Machine & its attachments
02	Tension Test on mild steel, Aluminium & compression test on cast iron on Universal Testing Machine.
03	Direct Shear Test of mild steel on Universal Testing Machine.
04	Brinell Hardness Test on Mild Steel.
05	Rockwell hardness Test on Hardened Steel.
06	Izod & Charpy - Impact tests of a standard specimen
07	Torsion Test on Mild steel bar.
08	Drawing sheet on shear force & bending Moment diagrams for a given loading (At least four problems.).
09	Estimation of principal stresses and maximum shear strain for a given combined loading by analytical & Mohr's circle method. (At least two problems.).

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **305**
NAME OF THE COURSE: **STRENGTH OF MATERIALS** PAPER CODE:6153

REFERENCES

1 Strength of Materials. by B.C. Punmia.
2 Strength of Materials . by R.S. Khurmi.
3 Strenght of Materials by Sadhu Singh.
4 Strength of Materials by K.D. Sexena.
5 Strength of Materials by S. Ramamuruthan.
6 Strength of Materials by I.B. Prasad.
7 Strength of Materials by Ryder.
8 Strength of Materials by Timo shanko & young
9 Laboratory Experiments In Strength of Materials by B.D. Sharma.
10 Dravya Samarthya (Hindi) by K. D. Saxena (Deepak Prakashan, Morar Gwalior)

DIPLOMA IN
MECHANICAL ENGINEERING

SEMESTER: **THIRD SEMESTER**
COURSE CODE: **306**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

DETAILED INSTRUCTIONS TO CONDUCT PROFESSIONAL ACTIVITIES

A. Study hours, if possible should be given greater time slot with a minimum of two hrs/week to a maximum of four hrs/week.

B. This course should be evaluated on the basis of grades and mark sheet of students, should have a separate mention of the grade awarded. There will be no pass/fail in professional activities (PA).

C. Following grade scale of evaluation of performance in PA has been established.

Grades	Level of performance
A	Excellent
B	Good
C	Fair
D	Average
E	Below Expectations

D. Grades once obtained in a particular examination shall become final and no chance of improvement in grades will be given to the students.

E. Assessment of performance in PA is to be done internally by the Institution, twice in a Semester/Term through a simultaneous evaluation of the candidate by a group of three teachers, of the deptt. Concerned. Group of teachers will jointly award the grade to candidate in the assessment. Best of the grades obtained by the student in these two assessments shall be finally taken on the mark sheet of the respective Semester/Term.

Candidate abstaining from the prescribed course work and/or assessment planned at the Institute shall be marked ABSENT in the mark sheet, instead of any grade.

F. While awarding the grades for performance in PA, examining teacher should reach the final consensus based on the attendance, punctuality, interest, presentation skills in seminar on the topic assigned (collection of relevant data, observations, analysis, findings/conclusion) and its written report, awareness of latest developments in the chosen programme of study.

G. Institution shall maintain the record of grades awarded to all the students in PA for a period of 1 year.

H. It shall be mandatory for students to submit a compendium for his PA in the form of a Journal.

I. Compendium shall contain following:
   I. Record of written quiz.
   II. Report/write up of seminar presented
   III. Abstract of the guest lectures arranged in the Institution.
   IV. Topic and outcome of the group discussion held.
   V. Report on the problems solved through case studies.
   VI. Report on social awareness camps(organized for social and environmental prevention).
   VII. Report on student chapter activities of professional bodies like ISTE, IE (India), CSI etc.

J. PA is not a descriptive course to be taught in the classroom by a particular teacher. Various activities involved in the achievement of objectives of this course should be distributed to a number of teachers so that the talent and creativity of group of teacher's benefit the treatment of the course content.

   These activities should preferably be conducted in English language to maintain continuity and provide reinforcement to skill development.

   Small groups shall be formed like in tutorials, group discussion, case studies, seminar, project methods, roll play and simulation to make the development of personality affective.

   Treatment of PA demands special efforts, attention, close co-operation and creative instinct on the part of teachers of department concerned. Since this course is totally learner centered, many of the activities planned under this course shall come out from the useful interaction of student, among themselves and with the teachers. The guide teacher/s shall best act as a facilitator of these creative hunts/ exercises, which unfold many of the hidden talents of the students or bring out greater amount of confidence in them, to execute certain activity.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6154**
COURSE CODE: **401**
NAME OF THE COURSE:**FLUID MECHANICS & HYDRAULIC MACHINES**

S.NO	CONTENT
1	**Fundamentals of Fluid Flow :** Definition of fluid, ideal and practical, compressible and incompressible fluids, fluid properties- density, specific weight, specific gravity, dynamic and kinetic viscosity, types of flow- laminar and turbulent, steady and unsteady, uniform and non-uniform. Continuity equation, Simple numerical problems on continuity equation.
2	**Pressure and Its Measurement:** Concept of pressure, intensity of pressure, Pascal's law, pressure head, gauge pressure, vacuum pressure, absolute pressure, manometers- Piezometer, U-tube manometer inclined manometer, differential manometer ,inverted U- tube manometer Pressure gauges, Bourdon tube pressure gauge. Simple numerical problems on differential manometers.
3	**Basic Equation of Fluid Flow:** Various form of energies applicable to fluid flow, potential energy, kinetic energy, pressure energy, total energy of fluid flow, Concept of datum pressure, velocity and total head of a fluid particle in motion. General steady flow energy equation, Bernaulli's theorem, assumptions made in deriving Bernaulli's theorem and derivation of Bernaulli's theorem, practical applications of Bernaulli's equation: venturimeter, orifice- meter, pitot tube, flow nozzle- Their construction, working and limitation. Simple problems on venturimeter, orifice meter, pitot tube.
4	**Flow Through Orifices and Mouth Pieces and flow measurement:** Definition and types of orifices, Vena contracta, coefficient of contraction., velocity, discharge and resistance . Torricell's theorem experimental determination of Cc, Cv and Cd. Head loss due to sudden enlargement, contraction and obstruction in pipe. Mouth pieces, Time of emptying vessel by orifice (cylindrical, conical) Flow from one vessel to another large orifices. Flow measurement by Rota meter, Volume flow meter

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6154**

COURSE CODE: **401**

NAME OF THE COURSE:**FLUID MECHANICS & HYDRAULIC MACHINES**

S.NO	CONTENT
5	**Flow Through Notches and Weirs :** Weirs and notches definition, Classification, flow over rectangular weir with and without velocity of approach, calibration of rectangular weir, different formula for large rectangular weir. Time required to empty a reservoir with rectangular weir, V-notch. Advantages of triangular notch over rectangular notch. Trapezoidal notch. Broad crested and submerged weirs. Practical application of weirs. Spillway and Siphon spillway, guage weir.
6	**Flow Through Pipes :** Laminar and turbulent flow, Raynold's number, differentiation of laminar and turbulent flow on the basis of Reynold's number, loss of head due to friction in pipes, Darcy's formula and Chezy's equation. Hydraulic gradient and total energy line. Flow through long pipes, pipes in series and parallel simple problems based on above formulae water hammer and its effect surge tank.
7	**Impact of Jets :** Impact of Jet on flat and curved plates stationary and moving, work done by Pelton wheel, velocity triangle, simple numerical problems on axial, radial flow.
8	**Water Turbines :** Meaning Classification Impulse and reaction turbine, Comparison description and working of Pelton, Francis and Kaplan turbines, Fanlaws specific speed & Selection of turbines.
9	**Water Pumps :** Centrifugal and reciprocating- principle construction, working classification and layout. Comparison of centrifugal and reciprocating pumps. Specific speed, selection of pumps. Use of air vessels in reciprocating pump, indicator diagram, horse power calculation in case of reciprocating pump. Horse power calculation in case of centrifugal pump. Operating characteristics.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6154**
COURSE CODE: **401**
NAME OF THE COURSE:**FLUID MECHANICS & HYDRAULIC MACHINES**

S.NO	CONTENT
10	**Model Analysis :** Geometric, Kinetic and dynamic similarity. Simple Problems.
11	**Hydel Power Station :** Schematic diagram, function of various elements, advantage over other power stations.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6154**
COURSE CODE: **401**
NAME OF THE COURSE:**FLUID MECHANICS & HYDRAULIC MACHINES**

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	To measure the pressure of water in pipe by (a) Piezometer (b) different types of monometers
2	To verify Bernaulli's equation.
3	To determine discharge through a given venturimeter.
4	To determine discharge through a given orifice meter.
5	To determine discharge through a Pitot tube.
6	To determine Cc, Cv and Cd for different types of orifices and mouth pieces.
7	To determine loss of head due to : (a) Sudden enlargement. (b) Friction in pipes.
8	To determine discharge through different types of notches.
9	Study of Pelton wheel, Francis turbine, and Kaplan turbines.
10	To determine performance characteristics.
11	Study of reciprocating pump.
12	To determine h.p. of reciprocating pump.
13	Study of centrifugal pump.
14	To determine operating characteristics of centrifugal pump.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6154**
COURSE CODE: **401**
NAME OF THE COURSE:**FLUID MECHANICS & HYDRAULIC MACHINES**

REFERENCE

1 A text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines. by Khurmi (S. Chand & Co.)

2 Fluid Machines by M. Manohar

3 Hydraulics & Hydraulic Machines by Dr. Jagdish lal (Metropolitan)

4 Hydraulics & Hydraulic Machines by Priyani.

5 Fluid Machines With Engineering Applications by R.L. Draught lery & A.C. Jugersoll. (McGraw Hills)

6 Journal of experiments in Hydraulic Laboratory by V. N. Rao & Husan New Heights.

7 Fluid Mechanics by Dr. M.L. Mathur (Std. Publications).

8 Taral Yantriki Avum Machinery (Hindi) by G.B. Bamanker. (Deepak Prakashan, Gwalior)

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6155**
COURSE CODE: **402**
NAME OF THE COURSE:**THERMAL ENGINEERING**

S.NO	CONTENT
1	**Dimensions and systems of units:** Basic and Derived units for common engineering variables and properties like mass, length, time, temperature, area, volume, velocity, acceleration, force, pressure, work, heat, energy, power etc.
2	**Sources of energy:** Brief description of energy sources Classification of energy sources, Renewable, Non-Renewable, Fossil fuels, including CNG, LPG; Solar Energy- Its nature, merits and demerits, potential; Flat plate and concentrating collectors & their application. Solar Water Heater, Solar Air Heater, Photovoltaic Cell, Solar Distillation; Wind, Tidal, Geothermal, Biogas, Biomass, Bio-diesel, Hydraulic, Nuclear, Fuel cell – list of fuel cells
3	**Basic Concepts of thermodynamics:** Definition and importance of thermodynamics, thermodynamic system open, closed and Isolated system, boundary and surrounding forms of energy. Point and path functions, properties of system intensive and extensive properties thermodynamic state, thermodynamic process, cycles thermodynamic definition of work, heat and thermodynamic equilibrium, Zeroth law of thermodynamics, Quasi-static process, work done during Quasi Static process.
4	**First Law of Thermodynamics:** Concept of heat reservoir, heat source and heat sink, Statement of first law, Mathematical representation, applications of first law to open and closed system. Concept of internal energy and its calculation, relationship between heat transfer, work transfer and change in internal energy. Differentiation between shaft work, flow work and displacement work; Steady flow energy equation and its application to various units such as boiler, nozzle, turbine compressor enthalpy.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6155**
COURSE CODE: **402**
NAME OF THE COURSE:**THERMAL ENGINEERING**

S.NO	CONTENT
5	**Second Law of Thermodynamics:** Limitation of first law. Statements of second law Kelvin, Planck and Clausius statements, Concept of heat pump, refrigerator and heat engine thermal efficiency. Parameters affecting thermal efficiency, means of increasing efficiency, COP. Equivalence and irreversible processes. Factors which make a process irreversible. Reversible cycle. Carnot cycle its efficiency and limitation ; Carnot theorem Clausius Inequality, concept of entropy, Principle of increase of entropy, determination of increase of entropy, principle of increase of entropy, determination of increase of entropy, Statement of third law of thermodynamics.
6	**Ideal Gases and Gas Processes:** Definition of an ideal gas, gas law, characteristics gas equation, specific and universal gas constants specific heat constant pressure and specific heat, constant volume. Ideal gas processes- isobaric isothermal, isentropic, polytropic and throttling process as applied to open and closed systems. Representation of these processes on P-V, T-S and H-S diagrams. Computation of change in enthalpy, entropy and internal energy. Net heat transfer and work done.
7	**Thermodynamic Cycles:** Air Standard cycles- definition and purpose standard efficiency, Carnot, Otto Diesel dual and Brayton cycles, their representation on P.V. & T.S. Diagrams. Derivation of air Standard efficiency and their comparison and limitation of each cycle. Vapour power cycle - Carnot cycle its limitation, Rankine cycle modified Rankine cycle- their representation on P.V.T.S. and H.S. Planes, derivation of expression for thermal efficiency.

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DIPLOMA IN MECHANICAL ENGINEERING

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NAME OF THE COURSE:**THERMAL ENGINEERING**

S.NO	CONTENT
8	**Two Phase System:** Pure substance phase, phase changes steam as a two phase system steam formation and its representation on temp- enthalpy plane. Properties changes, representation of wet dry and saturated and superheated steam on P.V., T.S. and H.S. planes. Dryness fraction of steam, methods of determination of dryness fraction separation and throttling calorimeter. Use of steam tables and Mollier's diagram . Determination of change in properties such as entropy enthalpy internal energy and work and heat transfer in the following processes- isobaric, isochoric, isothermal, isentropic, polytropic, throttling, and representation of various processes on P.V. and H.S. planes.
9	**Steam Generators:** Definition, classification, working of Babcock and Wilcox Boiler and Lancashire, Boiler Mountings and accessories.
10	**Steam Nozzle, Condensers and Turbines:** Steam nozzle and its use, Condenser-Classification, construction and working of surface condenser, Classification, working principle of steam turbines, difference between impulse and reaction turbine, compounding of steam turbine, velocity diagram (introductory and its use) Governing of steam turbine.
11	**Internal Combustion Engines:** Introduction, classification I.C. Engine Components and their function, working of two stroke and four- stroke cycle engines and their comparison. Indicator diagram, Calculation of IHP, BHP thermal efficiency, Mechanical efficiency and relative efficiency, Governing, Cooling and lubrication of I.C. Engines.

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DIPLOMA IN MECHANICAL ENGINEERING

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NAME OF THE COURSE:**THERMAL ENGINEERING**

S.NO	CONTENT
12	**Heat Transfer:** Modes of heat transfer; Conduction convection and Radiation. Fourier's law of heat conduction, temperature gradient, expression for determination of heat transfer across a flat plate, thermal conductivity and thermal resistance. Newton's law for heat transfer by convection, free and forced convection. Heat transfer by radiation Stefan-Boltzmann Law of thermal radiation. Define the terms- absorptivity, reflectivity and transmissivity; black body, emissive power, grey body. Heat exchanger; Shell and tube, Plate type and their applications.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6155**
COURSE CODE: **402**
NAME OF THE COURSE:**THERMAL ENGINEERING**

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Study and trial on solar water heating system
2	Report on visit to wind power generation plant / biogas plant / hydraulic power plant.
3	Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
4	Study or Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories..
5	Study of separating and throttling calorimeter.
6	Study of steam turbine.
7	Study of different types of I.C. engines (four stroke and two stroke C.I. and S.I.)
8	Study of various systems of I.C. engines. (a) Fuel supply system (b) Cooling system (c) Ignition system (d) Government system. (e) Lubrication system
9	Study of (a) Fuel pump (b) Fuel injector (c) Carburetor.
10	Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.
11	Numerical on vapour processes and ideal gas processes (minimum two problems on each)

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COURSE CODE: **402**
NAME OF THE COURSE:**THERMAL ENGINEERING**

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
12	Two phase systems equilibrium diagram on p-v , T-s, h-s plane
13	Study of flow of heat in natural environment at least 10 cases and relation to second law of thermodynamics

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SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6155**
COURSE CODE: **402**
NAME OF THE COURSE:**THERMAL ENGINEERING**

REFERENCES

1. Engineering Thermodynamics by P. K. Nag, Tata McGraw Hill Ltd. Engineering Thermodynamics, C. P. Gupta, Rajendra Prakash
2. Thermal Engineering by P.L. Ballani. (Khanna Publisher's N. Delhi)
3. A Course in thermodynamics And Heat Engines by Kothanandran, Khajuria and Arora (Dhanpat Rai & Sons Delhi)
4. Treatise On Heat Engineering by Vasandani & Kumar (Metropocitan Book Co. Ltd, New Delhi)
5. Thermodynamics by G.T. Van Wylen (john Wiley & Sons)
6. Thermodynamic And Heat Engines Vol . I & II by R. Yadav. (Central Book Depot, Allahabad)
7. Heat Power by Kashitish Chandra Pal (Orient Longman Hyderabad) I.S. 2986- 1966.
8. Tapiya Abhiyantriki (Hindi) by G.B. Bamankar (Deepak Prakashan, Morar Gwalior) .

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6156**
COURSE CODE: **403**
NAME OF THE COURSE:**THEORY OF MACHINES**

S.NO	CONTENT
1	**Simple Mechanism:** Introduction of theory of machines, definitions- statics, dynamics, kinematics, kinetics, kinematic pair, kinematic chain, mechanism, machine inversions, relation between number of links, number of joints and number of pairs, Four bar chain and its inversion, Slider crank chain and its inversions.
2	**Velocity and Acceleration of Points and Links :** Angular and linear velocity, relative and absolute velocity, velocity in links. Instantaneous centre, locating instantaneous centre of rotation, velocity determination of four bar mechanism by relative velocity method, Acceleration of link centripetal and tangential, total relative and absolute acceleration. Velocity and acceleration diagrams for four bar and other mechanisms. Klein's construction for single slider crank mechanism. Analytical method of calculating the velocity and acceleration of piston in a reciprocating engine mechanism.
3	**Dynamic force analysis, Crank Effort Diagrams and Flywheel :** Dynamics of reciprocating engine mechanism. Inertia force due to reciprocating mass, piston effort crank effort, turning moment on crank shaft, Analytical and graphical methods of construction of turning moment diagrams for steam and I.C. engines. Fluctuation of energy and speed. Coefficient of fluctuation of energy and speed. Flywheel and its function . Calculation of moment of inertia. weight of flywheel for steam and I.C. engines.
4	**Brakes and Dynamometers:** Brakes - need, types, braking force, braking torque. band brakes, block brakes, internally expanded brakes, dynamometer-meaning, need and types . Simple numerical calculation on above items

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6156**
COURSE CODE: **403**
NAME OF THE COURSE:**THEORY OF MACHINES**

S.NO	CONTENT
5	**Power Transmission :** Drives : meaning, Classification, belt, chain, rope and gear drives. Flat and ' V ' belt, ratio of tensions . Slip length of belt calculation for open and cross belt drive. H.P. transmitted. Effect of centrifugal force, centrifugal tension, total tension maximum stress in belt. Maximum Power transmitted. Velocity for maximum H.P. condition. V - Belt drives, advantages and disadvantages of V-Belt drives. Rope Drives : Types, ratio of tensions, Designation of ropes as per B.I.S. **Chain Drive :** Classification, designation of chain drives as per B.I.S.
6	**Governors :** Functional difference with flywheel. Classification : Watt, porter, proell and hartnell- their contruction and working. Sensitivity, stability, power and effort, hunting phenomenon and isochorisom of governor.
7	**Cams and Followers :** Need, Classification. motion of follower Displacement, velocity and acceleration diagrams uniform velocity, uniform acceleration and retardation. Simple harmonic motion. Cam profile for radial. offset knife edged follower.
8	**Balancing of Machine Parts:** Concept Static and dynamic balancing of rotating parts. Simple numerical problems on static balancing of several masses in single plane graphical and analytical method.
9	**Vibrations:** Introduction elements of vibration. System classification and explanation of the types of vibration according to the actuating force on the body like undamped vibration. Free damped vibration and forced damped vibration. Classification and explanation of the types of vibration according to the number of degrees of critical speed of shaft.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6156**
COURSE CODE: **403**
NAME OF THE COURSE:**THEORY OF MACHINES**

S.NO	CONTENT
10	**Gear and Gear Train:** Introduction , classification of gears , gear terminology , law of gearing ,velocity of sliding , forms of teeth – cycloid profile teeth , involutes profile teeth, path of contact, arc of contact. Interference in involutes gear , minimum no of teeth in gear and pinion classification of gear train . Function of idler. Calculation of velocity ratio, train value of gear train- simple, compound epicyclic and reverted gear train, motor car gear box.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6156**
COURSE CODE: **403**
NAME OF THE COURSE:**THEORY OF MACHINES**

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Study of inversions of four bar chain mechanism
2	Study of inversions of single slider crank chain mechanism (a) crank slotted lever mechanism (b) Whitworth quick return motion mechanism
3	Dynamic force analysis of single cylinder four stroke engine.
4	Study of flywheel
5	Study of governor
6	Study of different cam and follower
7	Study of different gear trains
8	Study of power transmission methods
9	Study of different types of break and dynamometer
10	Study of types of vibration and their measurement methods
11	Study of dynamic balancing procedure of rotating parts

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:6156**
COURSE CODE: **403**
NAME OF THE COURSE:**THEORY OF MACHINES**

REFERENCES

1 Theory of Machines by J.M. Shah & H.M. Jadhwani.
2 Theory of Machines by Abdulla Shariff
3 Theory of Machines by M.R. Malhotra & H.C. Gupta. (Technical India Pub.)
4 Theory of machines by P.L. Ballani .
5 Theory of Machines by Thomas Bevan .
6 Theory of Machines by S. S. Ratan.
7 Theory of Machines By R.S.Khurmi
8 Theory of Mechanism and Machine By Jagdish Lal

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:4100**
COURSE CODE: **404**
NAME OF THE COURSE: **INDUSTRIAL MANGEMENT**

CONTENT

SR. NO.	DETAILED COURSE CONTENT
1	**INTRODUCTION :** Definition and functions of management. Management theories - Decision, Quantitative, Mathematical and Behavioral Science.
2	**SYSTEM THINKING :** System definition and parameters. Different production and non-production systems, system design, different types of models under system thinking.
3	**MATERIALS MANAGEMENT :** Introduction, function, purchase systems, stock turn-over, ordered quantity. Inventory, need of inventory control, EOQ and simple numerical problems on EOQ. Safety stock, different techniques of inventory control, ABC analysis (simple treatment only). Stores management - storing procedure and store records.
4	**PRODUCTION PLANNING AND CONTROL :** Production systems, characterstics of each type, production and consumption rate. PPC functions, Gantt chart, advantages and preparation of Gantt chart (simple cases only), Critical ratio scheduling.
5	**VALUE ANALYSIS :** Concept of cost and value, types of value, objectives and procedure of value analysis, VA test, DARSIRI method of VA.
6	**PROJECT PLANNING BY NETWORK :** Network definition, objectives. CPM and PERT, activity, event, network formation, Fulkerson's rule, dependency of activities, dummy activity, duration, EST, EFT, LST, LFT, EPO, LPO, Total float and Free float. Network analysis in tabular form.
7	**INDUSTRIAL RELATIONS :** Need, objectives and functions of personnel management, job analysis and job description, recruitment procedure, selection, difference between recruitment and selection, training and its advantages. Communication in industry - its need and importance, techniques and barriers of communication. Grievances - its meaning and factors responsible for grievances, procedure for handling grievances. Strikes and Lock-out. Motivation - meaning and its benefits, techniques of motivation. Morale - definition and importance, factors responsible for high morale. Job satisfaction - factors influencing job satisfaction.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:4100**
COURSE CODE: **404**
NAME OF THE COURSE:**INDUSTRIAL MANGEMENT**

8	**SUPERVISION AND LEADERSHIP :** Meaning and role of Supervisor in an industry. Older workers and their supervision. Concept of Leadership, qualities of good leader, leadership styles.
9	**ORGANISATIONAL DYNAMICS :** Characteristics and principles of Organisation, Modern organisational approach, types of organisation, meaning and significance of various types of organisation, resistance to change, factors for reducing the resistance to change.
10	**OPERATIONS RESEARCH :** Definition and concept of OR, methods of OR, simple Linear Programming problem formulation and solution by Graphical method.
11.0 11.1 11.2 11.3 11.4 11.5	**NEW TRENDS IN MANAGEMENT :** Role of computers in management, Introduction to Management Information System (MIS). Total Quality Management (TQM) - Introduction, stages of development - Inspection, Quality Control, Quality Assurance, Total Quality Control, TQM. Introduction to ISO-9000. Deming's PDCA Cycle (Plan, Do, Check and Action). Japanese Quality Management, culture, Kaizen Strategy (continuous improvement), Quality Circle, Just In Time (JIT) - concept and application.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

PAPER CODE:4100

SEMESTER: **FOURTH SEMESTER**
COURSE CODE: **404**
NAME OF THE COURSE:**INDUSTRIAL MANGEMENT**

REFERENCES

1. Learning Package on Industrial Management
   Publisher : TTTI, Bhopal.

2. CPM and PERT - Principles and Applications
   By L.S.Shrinath

3. Indutrial Engg. and Management
   By O.P.Khanna.
   Khanna Publisher.

4. Industrial Organisation and Management
   By K.K.Ahuja

5. Modern Production Operation Management
   By Buffa
   Willey Eastern Ltd. (latest edition)

6. Production Operation Management
   By Goel B.S.
   Pragati Prakashan.

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SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:4200**
COURSE CODE: **411**
NAME OF THE COURSE: **ENTREPRENEURSHIP**

DETAILED COURSE CONTENT

1. INTRODUCTION TO ENTERPRENEURSHIP
   - Definition of Entrepreneur / Entrepreneur
   - Difference between Entrepreneurship / Entrepreneurship
   - Need for Entrepreneurship
   - qualities of successful entrepreneur
   - Myths about Entrepreneurship
   - Classification of entrepreneurs on the basis of different criteria
   - Reasons for the failure of entrepreneurs

2. INDUSTRIES AND BUSINESS ORGANIZATIONS
   • Concept of Industry or Enterprise •
   Classification of Industries
   (a) On the basis of capital investment
      – Tiny (Micro) Industry
      – Small Scale
      – Medium Scale
      – Large Scale
   (b) Others
      – Rural Industry
      – Cottage Industry
   (c) Forms of Business Organization
      – Proprietorship
      – Board & Co-operative
      – Partnership
      – Public Ltd.
      – Private Ltd.
      – IT Sector
      – Government Co-operative / Undertakings
   (d) Tiny small scale Industry
      - Definition
      – Its significance in National Development.
      – Govt. policies for SSI promotions
      – Sector / Product for SSI.
3. INSTITUTIONAL ASSISTANCE
   (a) Types of Institutional assistance
      – Infra - structural assistance

Technical Assistance
- FInancial assistance
- Marketing Assistance

(b) Information / guidance & Training
- SISI - ASK
- MPCON - CSIR
- CED- MA - NRDC

(c) Infrastructure
- D/C -

AVN/AKVN (e) Finance
- SIDBI - KVIB
  MPFC
- NABARD - MPWDC NSIC M

(d) Marketing
- MP- AGRO
- NSIC
- PM.LUN
- EXPORT COPPORATION
- KVIP
- MPHSVN
  MPLDC

(e) Quality Control
- BIS - FPO - MPLUN F.D.A.
- AG. MKT. Board

4. INCENTIVES / CONCESSION / FACITLITIES AVAILABLE
   - Seed money
   - Incentive / subsidies
   - Others (Phones, Lands etc)
5. PLANNING OF AN INDUSTRIAL UNIT (S SI)
   - Pre- Planning Stage
     - Scanning the environment
     - Market survey
     - Seeking information
     - product / project selection
   - Implementation Stage
     - PPR Preparation
     - DIC registration
     - Arrangement of Land
     - Arrangement of Power
     - Obtaining NOC / Licenses from various departments
     - DPR Preparation
     - Seeking financial assistance
     - Commercial Production
   - Post Implementation stage
     - Permanent registration from D.I.C.
     - Availing Subsidies
     - Diversification / Modification
     - Setting up of marketing channel / Distribution.

6. ACHIVEMENT MOTIVATION

- Historical perspective
- Concept of achievement motivation
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- Concept of achievement motivation
- Significance of achievement motivation
- Development of achievement motivation

7. FINANCIAL MANAGEMENT OF AN INDUSTRIAL UNIT (SSI)

- Tools of financial analysis
- Ratio analysis
- Fund Flow / Cash flow analysis
- Working capital and concepts
- Financial accounting

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:4200**
COURSE CODE: **411**
NAME OF THE COURSE: **ENTREPRENEURSHIP**

REFERENCES

1. Entreprenerial Development Vol. I,II,III By Vasant desai Himalaya Publicaton
2. CEDMAP (Center of Entrepreneurial development Madhya Pradesh)
3. Udyamita Vikas By Anand Prakshan

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:4300**
COURSE CODE: **412**
NAME OF THE COURSE: **MARKETING MANGEMENT**

S NO.	DETAILED COURSE CONTENT
1	**MARKETING & CONCEPT**
1.1	**Evolution of marketing-a historical background**
1.1.1	The stage of barter
1.1.2	The stage of money economy
1.1.3	The stage of industrial revolution
1.1.4	The stage of competition
1.1.5	The emergence of marketing
1.2	**Selected definitions of marketing**
1.3	**Different concept of marketing**
1.3.1	The exchange concept
1.3.2	The production concept
1.3.3	The product concept
1.3.4	The sales concept
1.3.5	The marketing concept
1.4	**Difference between selling & marketing**
1.5	**Benefits & significance of marketing**
1.5.1	Helps to remove causes for under development
1.5.2	Improve productivity & efficiency
1.5.3	Canalize country's economic resources properly
1.5.4	Insure better deal for consumer
1.5.5	Make economic planning meaningful & relevant etc.
2	**Marketing environment**
2.1	**Internal & external factors**
2.1.1	Demographic environment
2.1.2	Economic environment
2.1.3	Political environment
2.1.4	Physical environment
2.1.5	Technological environment
2.1.6	Competitive environment

2.1.7	Social & cultural environment
2.2	**Micro & macro environment**
3	**Marketing planning & organization**
3.1	**Scope & importance of planning**
3.2	**Steps in marketing planning process**
3.3	**Purpose & principle of organization**
3.4	**Models of marketing organization**
3.4.1	Line & staff type
3.4.2	Product based organization
3.4.3	Territory oriented organization
3.4.4	Complex organization
3.5	**Task of chief marketing executive**
3.6	**Decentralization**
4	**Market segmentation**
4.1	**Types of market**
4.2	**Definitions & benefits of segmentation**
4.3	**Method s of segmentation**
4.3.1	Geographic segmentation
4.3.2	Demographic segmentation
4.3.3	Psychographic segmentation
4.3.4	Buyer behavior Segmentation
4.3.5	Volume segmentation
4.4	**Steps in market segmentation**
4.5	**Market targeting**
5	**Market mix**
5.1	**Definition of market mix**
5.2	**Elements of marketing mix (4 P'S)-Product,Place,Price,Promotion**
5.3	**Environmental variable (uncontrollable variables)**
5.3.1	Customer variable
5.3.2	Competition variable
5.3.3	Trade variable
5.3.4	Environmental variable

5.4	**Product management**
5.4.1	Components of product • The core or basic constituent • The associated features • The brand names, package,label
5.4.2	Types of product • The generic product • The branded product • The differentiated product • The customized product • The augmented & potential product
5.4.3	The product line & product mix
5.5	**New product development (NPD)**
5.5.1	Significance & classification of new product
5.5.2	Stages in NPD
5.5.3	Estimating the demand for new product
5.5.4	Test marketing
5.6	**Product life cycle (PLC)**
5.6.1	Concepts & benefits of PLC
5.6.2	Different stages in PLC
5.6.3	Strategies used in different stages
5.7	**Place management**
5.7.1	Physical distribution • Definitions & importance of physical distribution • Designing the physical distribution system
5.7.2	The distribution channel • The role & importance of distribution channel • Planning & designing of distribution channel • Types of distribution intermediaries
5.8	**Price management**
5.8.1	The meaning & importance of pricing
5.8.2	Objectives of pricing
5.8.3	Factors affecting pricing –Internal & external

5.8.4	Pricing methods • Cost based pricing • Break even pricing • Demand based pricing • Competition based pricing • Product line pricing • Tender pricing • Affordability pricing • Differentiated pricing
5.8.5	Pricing policies & setting the price
5.9	**Promotion management**
5.9.1	Sales promotion • Importance & objectives of sales promotion • Tools &techniques of sales promotion
5.9.2	Advertising • Role & importance of advertising • Types of advertising • Deciding on the advertising budget • Evaluating advertising effectiveness
5.9.3	Difference between sales promotion & advertising
6	**Understanding consumer**
6.1	**Factor influencing buyer behavior** • Information from variety of sources • Socio-cultural environment of buyer • Group influence • Religion & language • Concern about status
6.2	**Buying motives –Product & patronage motive**
6.3	**Buying habits – Convenience, shopping and spatiality goods**
7	**Marketing research & sales forecasting**
7.1	**Definition & importance of marketing research**

7.2	**Steps in marketing research** • Defining problem • Problem analysis • Developing research design • Developing research procedure • Data collection –Primary & secondary • Analyzing & interpretation • Summarizing & preparing the research report
7.3	**Method of market research**
7.4	**Necessity & purpose of sales forecasting**
7.5	**Methods of sales forecasting**
8	**Sales management**
8.1	**Designing the sales force**
8.2	**Managing the sales force** • Recruitment & selection • Training, compensation, control • Supervision & direction • Motivation of salesman
8.3	**Fixing sales quota**
8.4	**Duties & responsibilities of sales manager**

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:4300**
COURSE CODE: **412**
NAME OF THE COURSE: **MARKETING MANGEMENT**

REFERENCES

1. Marketing management - Analysis, Planning & Control - Philip Kotler
2. Principles & practice of Marketing in India - C.B .Memoria & R.L.Joshi
3. Contemporary Marketing – Louis & Bone & David L. Kurtz
4. Essential of Management –Koontz
5. Marketing management- S.A. Sherlekar

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:**
COURSE CODE: **406**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

S.NO	CONTENT
1	**SOCIAL SKILLS** Society, Social Structure, Develop Sympathy And Empathy
2	Swot Analysis – Concept , How to make use of SWOT
3	Inter personal Relation Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.
4	Problem Solving **I)STEPS IN PROBLEM SOLVING,** 1)Identify And Clarify The Problem, 2)Information Gathering Related To Problem, 3)Evaluate The Evidence, 4)Consider Alternative Solutions And Their Implications, 5)Choose And Implement The Best Alternative, 6)Review **II)Problem solving technique**.(any one technique may be considered) 1) Trial and error, 2) Brain storming, 3) Lateral thinking
5	**Presentation Skills** Body language -- Dress like the audience Posture, Gestures, Eye contact and facial expression. PRESENTATION SKILL – STAGE FRIGHT, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:**
COURSE CODE: **406**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

S.NO	CONTENT
6	**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. **TWO** 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 v) ST workshop / City transport workshop
7	**Lectures by Professional / Industrial Expert be organized from Any Three of the following areas :** i) Use of a plastics in automobiles. ii) Nonferrous Metals and alloys for engineering applications iii) Surface Treatment Processes like electroplating, powder coating etc. iv) Selection of electric motors. v) Computer aided drafting. vi) Industrial hygiene. vii) Composite Materials. viii) Heat treatment processes. ix) Ceramics x) Safety Engineering and Waste elimination

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:**
COURSE CODE: **406**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

S.NO	CONTENT
8	**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) Assignments on bending moment , sheer forces , deflection of beams and torsion chapters of strength of material. f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable. g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes. h) 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. OR Conduct **ANY ONE** of the following activities through active participation of students and write report i) Rally for energy conservation / tree plantation. ii) Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc. iii) Conduct aptitude , general knowledge test , IQ test iv) Arrange **any one** training in the following areas : a) Yoga. B) Use of fire fighting equipment and First aid Maintenance of Domestic appliances.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FOURTH SEMESTER** **PAPER CODE:**
COURSE CODE: **406**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

S.NO	CONTENT
9	**Group discussion and Interview technique –** Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are - i) Sports ii) Current news items iii) Discipline and House Keeping iv) Current topics related to mechanical engineering field. **INTERVIEW TECHNIQUE** Necessity, Tips For Handling Common Questions
10	**Working in Teams** Understand And Work Within The Dynamics of A Groups. Tips To Work Effectively In Teams, Establish Good Rapport, Interest With Others And Work Effectively With Them To Meet Common Objectives, Tips To Provide And Accept Feedback In A Constructive And Considerate Way , Leadership In Teams, Handling Frustrations In Group
11	**Task Management**

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER:FIFTH SEMESTER
COURSE CODE: **501**
NAME OF THE COURSE: **PROCESS PLANNING ESTIMATING AND COSTING** PAPER CODE:4400

(A) PROCESS PLANING

S.NO	CONTENT
1	**Introduction to Planning:** Process engineering, its scope and relation with product engineering and manufacturing, production system, types and characteristics.
2	**Selecting and Planning the Process of Manufacture:** Function, fundamental rules for the manufacturing process, basic design of product, influence of process engineering on product design, rechecking specifications, how materials selected affect process cost, using materials more economically, material cost balance sheet, eliminating operations, combined operations, selecting the process tooling, availability of equipment, make or buy decisions.
3	**Determining the Manufacturing Sequence:** Operation, classifications and the manufacturing sequence, purpose of major process sequence.
4	**Operation Routing -** Routing uses, routing descriptions.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER : FIFTH SEMESTER
COURSE CODE: **501**

NAME OF THE COURSE: **PROCESS PLANNING ESTIMATING AND COSTING**

PAPER CODE:4400

(B) ESTIMATING AND COSTING	
S.NO	**CONTENT**
1	**Elements of Costs and their Allocation :** Definition and objective of Estimating & costing, desirable conditions for a costing system, advantages of costing, elements of cost, , direct material cost, direct labour cost, direct expenses, prime cost overheads, indirect materials, indirect labour, indirect expenses administrative and selling expenses, analysis of total cost fixed cost and variable cost. Break even analysis.
2	**Depreciation:** Definition & Concept, causes of depreciation methods of depreciation calculation.
3	**Profit:** Profit methods of increasing profit, effects of the methods on production, market and sales.
4	**Budget :** Definition, departmental budget and purpose of budgetary control.
5	**Overhead Allocation:** Definition and classification of overheads, methods of overheads allocation viz-direct material cost, direct labour cost, man hour rate and machine hour rate, selection of appropriate method limitation of various methods.
6	**Actual Cost Estimation:** Process Materials and Manpower - Terminology associated with estimation, Calculation of volume, weight and cost of materia ls.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

COURSE CODE: **501**

NAME OF THE COURSE: **PROCESS PLANNING ESTIMATING AND COSTING** PAPER CODE:4400

7	**Machine Shop:** Process, Materials and Man power - Terminology used in machine shop estimation, use of standard table to determine time elements for various machining processes, use of formulas to calculate actual machining time for different operations of machine tools, Calculation of production operation time per product per cycle, batch production time,
8	**Welding shop-** process, materials and Man-power Gas and Arc. Welding terminology, production operation time, labour cost, materials cost, cost elements, batch production cost.
9	**Forging Shop:** Process, Materials and Man power - Forging gross and net weight of forging, forging losses, materials cost, labour cost and batch production cost.
10	**Foundry Shop:** Process, Materials and Man- power - Pattern cost, production time for casting, material cost of casting, moulding cost, batch production time.
11	**Sheet Metal Shop Estimation:** Sheet Metal shop labour cost, materials cost, production time in piece work.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**
COURSE CODE: **501** PAPER CODE:4400
NAME OF THE COURSE: **PROCESS PLANNING ESTIMATING AND COSTING**

REFERENCE BOOKS

1 Cost Control by G. R. Sharma. (National Productivity Council)
2 Engineer[1] s Glude to Costing (Institute of cost works Accounts)
3 Mechanical Estimating And Costing by T.R. Banga and & S. C. Sharma

(Khanna Pub.)

4 Mechanical Estimation and Costing by R.L. Shrimali & P.C. Jam (Jam Pub. House)

5 Mechanical Estimation And Costing (Resource Persons of Hill Publishing Co. T.T.T.L, Madars Tata McGraw Hill)

6 Machine Shop Estimation by Nordoff.

7 Learing Packing In Costing And Estimating (T.T.T.I. Bhopal Publication)

8 Process Engineering For Manufacturing By Eary and Johnson (Prentice Hall)

9 Fundamentals of Process Engineering by Benjaman W. Nicbel, Alon & Ropy

10 Produce Design And Process Engineering (McGraw Hill)

11 Yantriki Abhiyantriki Abhikalpan (Hindi) by K. D. Saxena. (Deepak Prakashan, Morar, Gwalior).

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER
COURSE CODE: **502**
NAME OF THE COURSE: **MACHINE TOOL TECHNOLOGY** PAPER CODE:6158

S.NO	CONTENT
1	**Introduction :** Concept of machine tool technology, needs, area of use etc.
2	**Metal Cutting Theory:** Stages in cutting, factors affecting cutting, types of chips, built up edge (BUE) formation conditions and effect upon surface finish, definition of cutting force, feed force, radial force with the help of merchant circle diagram. Power requirement for each type of force. Tool geometry and influence of tool angles, desirable properties of cutting tool materials and their influences on the choice of tool material. Primary and secondary function of cutting fluids and properties of cutting fluids commonly used, types of cutting fluids. Cutting variables, tool wear and tool life. Taylor[1]s tool life equation and cutting speed calculation. Economy of metal cutting.
3	**Lathe:** Basic difference between centre, turret and Capston lathes, constructional details and specification. working principles and features of mechanical hydraulic and electrical copying system, rate of production, skill requirement, accuracy and cost of production. Working principles and types of automatic lathes, work holding and tool holding and tooling used for Capston and turret lathes, operation planning and tool layout for internal, external threading.
4	**Shaper, Drilling** & **Boring Machine.** Shaper- Construction, operation. application, Types of Drilling Machines, construction, operation and application, Horizontal and vertical boring machines constructional features, Jig boring machine, its construction, operation and application.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER
COURSE CODE: **502**
NAME OF THE COURSE: **MACHINE TOOL TECHNOLOGY** PAPER CODE:6158

5	**Milling Machines :** Define milin[g], Classification of milin[g] machines, Princi[p]les, [p]arts and their functions, ty[p]e s of table movement in universal milin[g] machine, s[p]ecifications of milin[g] M/C. Conventional and climb milin[g], different milin[g] o[p]erations and their a[pp]lica tion, milin[g] cuters and tool an[g]les, s[p]ecification and cuter materials, use of arbor, colets and ado[p]ters machine atachments, methods of mountin[g] the cuter, work holdin[g] devices, dividin[g] heads. Direct, sim[p]le and differential indexin[g], selection of cuters, s[p]eed feed, [p]rocedure for setin[g] up o[p]erations and ins[p]ections, maintenance of milin[g].
6	**Grinding Machines and Finishing processes** Definition of grinding andcutting action in grinding, types of abrasive materials and their properties, binding materials, grinding wheel classification and standard marking system, conditions for selection of grinding wheels. Balancing of grinding wheels, glazing and loading, methods of dressing and tracing, Principles of working of grinding machines, types Of grinding process, functions of tool and work holding devices, feed arrangement, table drive in surface and cylindrical grinders. Types of lubricants and coolants used in grinding, grinding defects, their remedy and safety practices. Definition of honing, lapping, super finishing methods, equipments involved, Materials used, tolerances obtained and limitations, applications of honing and lapping processes.
7	**Special purpose Machines** Difference between forming and generation ofgears, principle of gear shaping, hobbing and shaving, rate of production accuracy and limitations. Thread production : thread rolling and thread milling. Broaching Machines : Definition of Broaching, types of broaches broaching machines, advantages and limitations.

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NAME OF THE COURSE: **MACHINE TOOL TECHNOLOGY**

S.NO	CONTENT
8	**Jigs and Fixtures :** Functions of Jigs and fixtures, 3-2-1 principle of location, Design criteria for simple jigs and fixtures
9	**Machine Tool Drives :** Requirements of machine tools, elements of machine tools and their purpose Drive Systems : Stepped and step less drives, advantages and limitations of the gear box drives, function of feed box, types of feed gear boxes, working and advantages. Principle of straight line motion, multihandle, single lever and pre-selective control system
10	**Plastic Moulding:** Types of plastic, Compression moulding, Transfer moulding, Injection moulding, Blow moulding, Vacuum forming, Extrusion

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LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Demonstration of formation of chips on a lathe, continuous, discontinuous and fractured by changing variables like rake angle, speed feed and depth of cut.
2	Demonstration of built up edge on the finished tool point by changing speed and depth of cut while machining on a mild steel bar.
3	Measuring of angles of a single point tool with reference to main plane with the aid of tin templates.
4	Grinding of single point (H.S.S.) tools.
5	Demonstration of preparing soluble oil cutting fluid and its use for improving the surface.
6	Practice of taper turning and screw cutting on a centre lathe.
7	Practice of making the pins or rivets of any size on a capstan lathe.
8	Demonstration of making a flanged bush on a capstan lathe including setting.
9	Practice of drilling, boring and reaming on a lathe.
10	Practice of mounting cutters on the milling m/c and setting of m/s.
11	Practice of up milling and down milling operation.
12	Practice of cutting the spur gear on milling machine.
13	Practice on a shaper square block on a shaper and milling machine (Comparison of surface produced).

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LIST OF EXPERIMENTS

S.No.	EXPERIMENT
14	Surface grinding or tapping on a flat surface.
15	Practice of cutting a helical gear on a milling m/c.
16	Performance test of a lathe by making **a long mandrel.**
17	Study of special purpose machines using web aid
18	Study of different machine tool drive using physical machines and web aid

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REFERENCE BOOKS

1. Workshop Technology Vol. I & II by Hajra Chaudhary, (Media Promoters & Publishers Pvt. Ltd. Mumbai)
2. Workshop Technology Vol. I , II and III by W.A.J. Chapman, (ELBS)
3. Manufacturing Processes & Systems by Phillip F. Ostwald & Jairo Minoz (John Willey & Sons.)
4. Production Technology- HMT Handbook (HMT)
5. Production Technology by Jam Gupta, (Khanna Publishers, New Delhi)
6. Manufacturing Processes by Begeman Amstead, (Wiley.)
7. Manufacturing Processes by Rusinoff, (Tata McGraw Hill Publishing Co. Ltd.)
8. Advanced Manufacturing Technology by Kalpakjian (Addison Wesley)
9. Manufacturing Technology - Metal Cutting & Machine Tools by P. N. Rao (TMH).
10. Workshop Technology Vol. II by Bawa H. S. (TMH).
11. Manufacturing Science and Technology Vol. I & II. by Suresh Dalela (Umesh Publication).
12. Workshop Technology Vol. I and II by B. S. Raghuvanshi (Dhanpat Rai & Sons).
13. Production Technology by R. K. Jam (Khanna Publishers, Delhi).
14. Vijayvargiya P.N."Machine Tool" Shilp Vigyan (Hindi) (Deepak Prakashan, Morar Gwalior.)

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: FIFTH SEMESTER

COURSE CODE: **503**

NAME OF THE COURSE: **ENGINEERING MEASUREMENTS AND MAINTENANCE PRACTICES**

PAPER CODE: 6159

S.NO	CONTENT
1	**Inspection:** Meaning and application of inspection, daily life examples of inspection, concept of inspection as applied in industries. Effect of absence of inspection in an industry. Classification of inspection, function, meaning and advantages of each concept of inspection applied to metrology. Definition & meaning of precision. accuracy and error, need of precision measurement in industry, relationship between cost and accuracy, Interchangeability and selective assembly.
2	**General Measurement Concept:** Limits, fits and tolerances, selection of fit, calculation of fundamental deviation, tolerance and limits, selection of limits, tolerances and allowances.
3	**Linear Measurement:** Standards of length, classification and use of slip gauges, wringing process , precautions to be observed while using slip gauges, classification of linear measuring instrument, direct and indirect, construction and working of vernier callipers, micrometers, vernier height gauge, dial vernier and dial height gauge, finding least count, precautions. Dial gauge-types, construction, principle, accuracy and precautions, comparators - principle, types, working and field of application of Mechanical, electrical, optical and pneumatic comparators.
4	**Angular Measurement:** Need of angular measurement , various instruments used. Methods of measurement and field of application of protractor, angle gauges, Sine bars, spirit levels, clinometers and angle dekkor.
5	**Straightness, Flatness, Squareness and Roundness Testing: General** concept straight edge method, light gap and feeler gauge method, wedge method, use of V- Block and dial indicator for checking roundness.

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S.NO	CONTENT
6	**Surface Roughness:** Definition of primary and secondary texture , CLA value, R.M.S value, Types of surface measuring instrument, Working principle of Tomlinson mechanical surface finish recorder.
7	**Screw Thread Measurement:** Types of screw threads, threads nomenclatures, errors in screw thread, equipment required for measuring pitch, effective diameter and angle- procedure, advantages, limitation and precautions of each method
8	**Limit Gauges:** Definition of gauge and gauging, necessity of gauging in industrial practice, types according to use (shop inspection and reference gauge), limit gauges for specific use - screw pitch gauge, template feeler gauge, working tolerance of gauges, maximum and minimum metal conditions to tolerance. Selection and specification as per IS 2251, 3455, 3484 Wear allowances and its selection for design, Taylor[1]s principle for design of IGo Iand INo Go1 gauges. Calculation of gauge dimensions form formula given in IS 3455 and selection of parameters necessary for calculation.
9	**Transducers:** Meaning, function, primary and secondary transducers . Classification- mechanical electrical, active, passive . Comparision of electrical and mechanical transducers, Working principle and application of resistance type, inductance type, capacitance type and piezo electric type.
10	**Temperature measurement:** Principle on which temperature measuring devices work- example of each type. Comparison of resistance thermometer and thermister. Thermocouple- Principle, material, and working. Working principle of optical and radiation pyrometers.

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S.NO	CONTENT
11	**Introduction to Plant Maintenance:** Introduction to maintenance, its need and scope, functions of the maintenance department. Different maintenance practices, procedure of corrective or break down maintenance, scheduled maintenance, preventive maintenance and predictive maintenance, methods of keeping records for condition of equipment, maintenance and replacement of parts, standard data for maintenance form, time standards (time to complete the maintenance job).
12	**Fault Tracing:-** Trouble Shooting and Remedies, Sequence of activities in fault finding, methods and procedures of repair, various measures to prevent repetition of similar faults. Various remedial actions.
13	**Maintenance Cost:** Definition, classification, Kelvin graph, procedures for obtaining cost data, maintenance cost control.
14	**Wear and its effect:** Definition of wear and types of wear, causes of wear, effects of wear on performance, wear reduction and component replacement.
15	**Lubrication and Lubricating Systems:** Need, properties of lubricant, selection criteria, principle of lubrication, centralized and decentralized lubrication systems, boundary, layer and hydrodynamic lubrication, use of greases and oil. Methods of preserving lubricants, handling of lubricants.

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LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Study of application of various types of instruction.
2	Study of different type of fits with their practical application
3	Study of **Indian standareds IS: 919 recomanded** for limit and fits.
4	Demonstration of selective assembly.
5	Demonstration of concept of interchangeability using different objects.
6	Measurement of diameter, length, thickness etc. Using different calipers and steel rule.
7	Measurement of various parameters of different objects using vernier caliper & Micro-meter.
8	Measurement of various parameters of different objects using combination set.
9	Build up gauage blocks to produce different dimensions.
10	Measure different angles usidng vernier protractor.
11	Measure of unknown angle with the help of a sine bar and a slip gauge set.
12	Measure different angles using angle gauges.
13	Check for flatness, and parallelism of an object using a dial indicator and surface plate.

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LIST OF EXPERIMENTS

S.No.	EXPERIMENT
14	Check for roundness of an object using a dial indicator and a V-block.
15	Examine the surface texture of the machined surface by a microscope.
16	Examine the surface roughnees of a machined surface using Tomlinson surface meter.
17	Use of plug and ring gauges for checking holes and shafts.
18	Demonstration and explaination of different types of transducers.
19	Study of different types of pyrometers.
20	Visit of large! medium'small scale industries for colleting the information regarding various measurement techniques and instruments.
21	Maintance practice on lathe and shaper m$_i$'cs.
22	Fault tracing and trouvel shooting on tube light, table fan, Room heater, hand drill m'c etc.
23	Measurement of wear on flat surfaces by Hydrostatic method.
24	Measurement of wear on cylindrical objects by micrometer and Dial indicator & V- block.
25	Lubrication practices on different machine tools.
26	Visit of large !Medium !Small scale indidustries for collecting information regarding record keeping for condition of equipment , maintenance scheduling & various practices , lubrication plan , tools & equipments used, safety measure etc.,

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NAME OF THE COURSE: **ENGINEERING MEASUREMENTS AND MAINTENANCE PRACTICES**

PAPER CODE:6159

REFERENCE BOOKS

1. Engineering Metrology. by R.K. Jam (Khanna Pub. Delhi)
2. Engineering Metrology. by I.C. Gupta (DANPAT RAI & SONS)
3. Inspection & Gauging by Kennedy (The Industrial Press, 93, Wortinstreet, New york)
4. Engineering Metrology by K.J. Hume. (Macdonald & Co. Ltd. London)
5. Practical Metrology by K.J. Hume . (Macdonald & Co. Ltd. London)
6. Hand book of Industrial Metrology by R.S.T.M.E. (Prentice Hall of India) a. .Metrology & Gauging S.A.J. Parsons. . (Macdonald & Erass. Ltd. London).
7. Industrial Instrumentation by D.P. Eckman (Wiley Easter Ltd. New Delhi)
8. Measurement Techniques in Mechanical Engineering by R.J. Sweeny i. (jon wiley & Sons, New York Addson Wesley Pub. London)
9. Mechanical Measurement by Becjwith Buck (Addson Wesley Pub. London)
10. Instruments For Measurement Control by W.G. Holzbock (Rainold Pub. Co-operation)
11. Mechanical & Industrial Measurement R.K. Jam (Khanna Publishers New Delhi)
12. IS Code: 2986, 5979, 5876, 5939
13. Maap Vigyan Avum Yantrikaran (Hindi) by Yogendra Varshneya. (Deepak Prakashan, Morar,Gwalior)
14. Industrial maintenance - H.P. Garg (S. CHAND & Company Ltd
15. Accident Prevention Manual For industrial Operations by Frank E. McElroy, P.E., C.S.P. Editor in Chief National Safety Council Chicago, U.S.A.
16. Accident Prevention Manual For Administration And Programs.
    i.By Frank E. McElroy, P.E., C.S.P. Editor in Chief National Safety Council Chicago, U.S.A.
17. Commentary on Factories Act with M.P. Rules by Krishanlal Sethi (The law-years Home Indore -7)
18. Industrial Accident Prevention by H.W. Heinrich (Mc Graw Hill Book Company, INC)
19. An Introducton to Safety Engineering and Management by N.y. Krishnan (CPS Pub. Pvt. Ltd. Calcutta)
20. aintenance of Industrial Equipment by B. Gelberg, G. Peklis.
21. Guide to Efficient Maintenance Management by H.V. Mstwatt.
22. Modern Maintenance Management by Miller and Bood.
23. Maintainability by Benjamin S. Blanshard, E. Edward, Lowery
24. Maintenance Engineering Hand Book by Morrow.
25. Repair of Industrial Equipment by B. G. Edberg, G. Peklis.
26. Sanyantra Anurakshan Avum Suraksha Abhiyantriki (Hindi) by Yogendra Varshney Deepak Prakashan, Morar, Gwalior)

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

COURSE CODE: **504**

NAME OF THE COURSE: **MODERN PRACTICES IN MANUFACTURING AND MANAGEMENT**

PAPER CODE:6160

Part-I

Modern Practices in Manufacturing:

S.NO	CONTENT
1	**Unconventional Machining Methods:** Limitations of conventional machining. Working Principle, operating parameters and application of unconventional machining. Electro Chemical Machining, Chemical Machining, Electric Discharge Machining, Electron beam Machining, Ultra Sonic Machining, Abrasive Jet Machining, LASER Beam Machining, Plasma Arc Machining.
2	**Coating** & **Deposition processes:** plating & related processes, physical vapor deposition, chemical vapor deposition, Organic Coating,
3	**Rapid Prototyping:** Need, Fundamentals, Technologies and applications.
4	**Manufacturing Automation:** Introduction to Numerical control, Computer Numerical control, Direct Numerical Control, CNC Millings M/c, CNC Turning M/c, Turn mill centers, flexible manufacturing system, Preliminary idea of robotics. Introduction to G and M code as used in part programming. Use of Canned cycles. Simulation of parts, drawing generated through CAD, its modeling and transfer
5	**Flexible Manufacturing systems:** Elements, Limitations, Feature & Characteristics, New development.
6	**Robotics:** Introduction to robotics, concept, and application, A4 level automation
7	Total Quality Management (TQM)-Evolution, definition, preparation stages in TOM implementation, Integrated TOM model, costumer satisfaction, Employee involvement. Continuous Process Improvement, 5s, Kaizen, and KANBAN, Supplier Partnership, Performance Measures. Just in Time systems (JIT) - Introduction, application and advantages
8	Total Productive Maintenance (TPM)- Introduction, Plan, New Philosophy Improvement needs, Six Major losses Life cycle costing, work groups.

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NAME OF THE COURSE: **MODERN PRACTICES IN MANUFACTURING AND MANAGEMENT** PAPER CODE:6160

Part-II

Modern Practices in Management

S.NO	CONTENT
9	**Introduction to Quality Standards:** ISO 9000- Introduction History, Indian Equivalence, System requirements for ISO 9001, 9002,9 003, steps for installation, How to apply. 05 9000 Quality Management systems. ISO 14001- Introduction, Environment Management system, Background, vocabulary and Application OHSAS 18001- Occupational Health and Safety Assessment Series Introduction, scope, related terms, structure and operating features TS 16949- Quality system certificate consisting following standard a. APQP - Advance product quality planning b. FMEA - Failure mode and effect analysis c. MSA- Measurement system analysis
10	**Lean manufacturing:** System design for Lean manufacturing adopting.
11	Why Why analysis (5W 1 H): Use of Why Why analysis to know the actual cause of failures and problems.
12	Six Sigma systems: Basics of Six Sigma, competitive advantage of implementing six sigma systems. Briefs of what, why and how six sigma works to initiate and sustain greater productivity, profitability and customer satisfaction rates.

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LIST OF PRACTICALS

S.No.	PRACTICAL WORK
1	Visit to a nearby installation / Study and practice at least two of the following: a. ECM b . C M c. EDM d. EBM e. USM f. Laser and Beam Machining g. Abrasive Jet Machining h. Plasma Arc Machining
2	Visit to a nearby installation having coating facilities/practical on coating process.
3	Visit to a nearby installation / Study and practice at least two of thefollowing: a. NC b. CNC c. DNC d. CNC Milling e. CNC Turning
4	Manual part programming (for simple jobs) on a CNC Milling or Turning machine.
5	Visit to a nearby factory and estimation of six major losses on the critical machine
6	Prepare a plan for getting ISO 9001 Certification for an Industry.
7	Seminar on TOM Philosophy, TPM.
8	Seminar on Six Sigma practice.

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NAME OF THE COURSE: **MODERN PRACTICES IN MANUFACTURING AND MANAGEMENT**

PAPER CODE:6160

REFERENCE BOOKS

1. Fundamentals of Manufacturing processes, G. K. Lal & S. K. Choudhary, Narosa Publishing House.
2. A Text book of production Technology (Manufacturing Processes) by P.C. Sharma, S. Chand & Co.
3. Manufacturing Technology Vol. II By P.N. Rao, Tata McGraw Hill Publishing Co.
4. Fundamentals of Modern Manufacturing By Mikell P. Groover, Wiley Student Edition.
5. Quality Management By Donna C.S. Summers Pearson Prentice Hall
6. Total Quality Management By L. Sugandhi & Anand A. Samuel Prentice Hall of India Pvt. Ltd.

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SEMESTER: **FIFTH SEMESTER**

COURSE CODE: **505** **PAPER CODE:6161**

NAME OF THE COURSE: **INDUSTRIALENGINEERING**

S.NO	CONTENT
1	**Introduction:** Definition of industry and industrial engineering, scope and role of industrial engineering fields of a pplications.
2	**Productivity:** Production and productivity, production systems and their impact on productivity, its significance and benefits of higher productivity. Long term and short term factors affecting productivity, productivity cycle.
3	**Work Study:** Introduction, its relation with productivity aims, objectives and application of work study, basic procedure and techniques of work study. Human factors in work study. Role of manager, supervisor and workers. Working conditions, environment of industry affecting work study.
4	**Method Study:** Definition objectives, basic procedures of methods study. Recording techniques, operation process chart, flow process chart, machine chart, flow diagrams, string diagrams, two hand process charts, questioning technique procedure to develop, install and maintain new methods.
5	**Principles of Motion Economy:** Meaning, basic rules design of efficient work place- layout, classification of human body movements and their preferred order.
6	**Material Handling and Plant Layout :** Importance and its effects on productivity, requirements of good material handling system, classification and selection of material handling equipment. Requirements of good layout. Effect of bad layout, Factors affecting plant layout, types of layout, advantages and limitations of each type of layout selection of layout, factors affecting the plant location.

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NAME OF THE COURSE: **INDUSTRIAL ENGINEERING**

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S.NO	CONTENT
7	**Micro Motion Study:** Definition and objectives, techniques of micromotion study, therbligs and their symbols, use of therbligs, SIMO chart and its application.
8	**Work Measurement:** Definition, Basic procedure and technique to work measurement. Stop watch time study, types of stop watch study, factors considered in selecting a job for time study, qualified and representative workers, procedure of stop watch time study, job element and their need of identification, general rules for break down of job into elements, work cycle, methods of time measurement, performance rating, its meaning, standard rating, rating of operators, conditions for operators variation at work place rating scales, rating factors, calculation of basic time. Allowances- purpose, types. Calculation of standard time synthesis method- meaning, data, complication, advantages and limitations. **PMTS-** Definition principle and use, calculation of standard time. **MIM -** Meaning, tables and use. Application of MIM analysis for LH-RH charts, calculation of standard time. **Work/ Activity Sampling:** Definition, statistical basics, determination of number of observation for given accuracy, sources of error, application and calculation of standard time.
9	**MOST Technique for work measurement:** Definition of terms, concept of the MOST, Basic MOST sequence models, Time Units, Parameter Indexing, Method Accuracy and Sensitivity, Levels of Work Measurement, Compatibility of MOST systems, Application of MOST

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S.NO	CONTENT
10	**Job Evaluation, Wages and Incentives:** Definition, need and scope of job evaluation. Job evaluation systems and their comparative merits and demerits and limitations. **Wage:** Definition, wage components, wage fixation, real, minimum and fair wage. Financial and non- financial incentives and their examples. Wage plans- Halsey, Taylor, differential plan, Gantt task and bonus plan, 100% premium plan.
11	**Statistical Quality Control:** Definition of quality and total quality, three stages of quality, quality control and SOC. difference between inspection and quality control, concept of variability, natural variation, its importance to quality control , classification of quality, characteristics, basic tools of SOC and their application, frequency distribution, measures of central tendency and dispersion, their need and calculations. Normal Curve : Definition, characteristics, calculation of area under normal curve and its application, statistical tolerance their calculation and application. Process capability meaning calculation and use.
12	**Control Charts for Variables:** Statistical basic for control Charts for variables, construction of X and R Charts- their interpretation, use of X and R chart in establishment of process capability.
13	**Control Charts for Attributes:** Limitation of X and R charts, Meaning and use of attributes, their advantages, Calculation, construction, interpretation and application of p- chart, c- chart, ph-chart. Need of calculating the revised values of mean, and control limits and their calculation.

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NAME OF THE COURSE: **INDUSTRIAL ENGINEERING**

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S.NO	CONTENT
14	**Acceptance Sampling:** Meaning different techniques procedure involved sampling inspection meaning and comparison with 100 % inspection. Factors affecting sampling and their effects. Single and double sampling plans, use of IS codes. O.C. Curves : Meaning, terms used, their definition, construction and use of O.C. curves. Selection of sampling plans.
15	**Reliability:** Definition quality control and reliability factors affecting reliability of product. Measures to ensure reliability of product, effect of product reliability marketing. M.T.B.F and M.T.T.F. Definition programme for reliability. Maintainability and availability

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NAME OF THE COURSE: **INDUSTRIAL ENGINEERING**

PAPER CODE:6161

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Preparation of flow process chart for existing and improved process.
2	Preparation of man and machine chart for existing and improved process.
3	Preparation of L.H. and R.H. charts for existing and improved process.
4	Use of decimal minute watch.
5	Performance rating.
6	Establishing standard time for given operation using time study techniques.
7	Use of Shewharts bowl and actual production for frequency distribution.
8	Preparation of X and R charts.
9	Preparation of p- chart and c- chart.
10	Work measurement using MOST
11	Acceptance sampling by attributes (single and double sampling plans)
12	Determination of the percentage utilization of equipment (work sampling)
13	Application of principals of motion economy

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NAME OF THE COURSE: **INDUSTRIAL ENGINEERING**

REFERENCE BOOKS

1 Introduction To Industrial Engineering by Philip Hicks (McGraw Hills)
2 Productivity Means Property (Asian Productivity Organisation, Tokyo)
3 Introduction To Work Study (International Labour Office)
4 Work Study by M.D. Schmid & Subrammaniam
5 Motion and Time Study by Ralph M. Barnes John Willey New York
6 Work Study by Dalela.
7 Wage Administration by D.K. Roy. (N.P.C. Publication).
8 Quality Assurance Engineering by M.D. Schmid & Subramaniam.
9 S.Q.C. by E.L.Grant.
10 S.Q.C. by R.C. Gupta.
11 Industrial Engineering & Management by 0. P. Khanna.
12 Industrial Engineering by Saxena.
13 MOST Work Measurement Systems, Kjell B. Zandin, Marcel Dekkar Inc. New York
14 Material Handling Equipment (N. Rudenki Place Pub)
15 Learning Package In Industrial Engineering by O.D.C. , T.T.T.I Bhopal
16 Laboratory Manual Industrial Engineering by O.D.C. , T.T.T.I
17 Audyogiki Abhiyantran (Hindi) by J.C.Varshneya. (Deepak Prakashan, Gwalior)
18 Audyogik Engineering (Hindi) by K.D. Saxena. (Deepak Prakashan, Gwalior)

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SEMESTER: **FIFTH SEMESTER**
COURSE CODE: **506**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

S.No.	Content
1	**Industrial Visits** Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries : Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant . i) Machine shop having CNC machines. ii) ST workshop / Auto service station iii) City water iv) Manufacturing
2	**Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas:** Interview Techniques. Modern Boilers – Provisions in IBR Applications of Sensors and Transducers Alternate fuels – CNG / LPG , Biodiesel, Ethanol, hydrogen Piping technology
3	Information Search : Information search can be done through manufacturer's websites, magazines, books etc. and submit a report Following topics are suggested :

	I) Engine lubricants & additives ii) Automotive gaskets and sealants iii) Engine coolants and additives iv) Two and Four wheeler carburetor. v) Power steering vi) Filters vii) Different drives/Transmission systems in two wheelers. viii) Types of bearings - applications and suppliers. ix) Heat Exchangers x) Maintenance procedure for solar equipment. Tools holder on general purpose machines and drilling machines.	

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **FIFTH SEMESTER**

COURSE CODE: **506**
NAME OF THE COURSE: **PROFESSIONAL ACTIVITIES**

S.NO	CONTENT	STUDY Hrs.
4	Student Activities: The students in a group of 3 to 4 will perform **any one** of the following activities (others similar activities may be considered Activity: i) Collect and study IS code for Engineering Drawing.. ii) Collecting information from Market: Nomenclatures and specifications of engineering materials. iii) Specifications of Lubricants. iv) Draw orthographic projections of a given simple machine element using and CAD software	**06**
5	Seminar: Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes)	**08**

6	Mini Project/Activities: (anyone) a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as: i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers v) Geneva mechanism b) Dismantling of assembly (e.g. jig / fixtures • tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts. c) Make a small decorative water fountain unit. d) Toy making with simple operating mechanisms.	**18**

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Learning Resources:

BOOKS

Sr. No	Author	Title of the book	Publisher
1	Marshall Cooks Adams	Time management	Viva Books
2	E.H. Mc Grath , S.J.	Basic Managerial Skills for All	Pretice Hall of India, Pvt Ltd
3	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
4	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
5	by Adair, J	Decision making & Problem Solving	Orient Longman
6	Bishop, Sue	Develop Your Assertiveness	Kogan Page India
7	Marion E Haynes	Make Every Minute Count	Kogan page India
8	Steven L McShane and Mary Ann Glinow	Organizational Behavior	Tata McGraw Hill
9	Stephen P. Robbins	Organizational Behavior	Pretice Hall of India, Pvt Ltd
10	Michael Hatto	Presentation Skills	(Canada - India Project) ISTE New Delhi
11		Stress Management Through Yoga and Meditation	Sterling Publisher Pvt Ltd
12	Richard Hale ,Peter Whilom	Target setting and Goal Achievement	Kogan page India

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE: **601**
NAME OF THE COURSE: **DESIGN OF MACHINE ELEMENTS**

Course code-6162

S.NO	CONTENT
1	**Introduction to Machine Design:** Machine and machine elements, bolt, nut, axle, shaft, bearing, coupling, clutch, belt, rope, chain, gear etc. Specific purpose of piston connecting rod, crank shaft, turbine blade etc. Factors influencing design of machine elements - Strength stiffness, light weight, wear resistance minimum size, availability, processebility, safety, compliance with standards. Basic design procedure. Selection of mechanism, material, shape and size. Preliminary design, applying checks, revision of design final design. Factors influencing selection of materials. Type of failures, types of forces. Types of loading. Safe design stress and factors of safety.
2	**Design of Machine Elements Subjected to Direct and Shear Loads:** Introduction members subjected to direct loads – bolt, column, rod, cotter and knuckle joints, members subjected to shear loads rivet, cotter knuckle pin, root of threaded bolt , coupling, bolt, key. Function, application and design of knuckle and cotter joint.
3	**Design of Machine Elements Subjected to Bending Moment Twisting Moment and Combined Bending and Twisting Moment :** Introduction to pure bending, fundamental equation of pure bending viz : M/I = f/y = E/ R Design of shaft, key, flange coupling, leaf and helical spring, pulley arms, axle

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **601**

NAME OF THE COURSE: **DESIGN OF MACHINE ELEMENTS**

PAPER CODE:6162

S.NO	CONTENT
4	**Design of Riveted Joint:** Type of fastening - temporary and permanent, types of riveted joint - lap and butt joint, definition of common terms like pitch, back pitch, efficiency, margin. Modes of failure of riveted joints.
5	**Design of Simple Welded Joints:** Definition of welding advantages of welding over riveted joints, types of welded joints, strength of the butt weld, types of fillet joints and strength of fillet joint problem solving.
6	**Design of Threaded Joints:** Types of threads and their proportions, Types of bolts, proportion of nut and bolt dimensions, design of bolt, designation of threads as per I.S. codes.
7	**Design of Clutch:** Pivots and Collars friction. Horse power lost assuming uniform pressure and uniform wear. Clutch- need, classification and construction and working of single and multi plate clutches, horse power transmitted by single and multi plate clutches.
8	**Selection of Rolling and Sliding contact Bearing:** Types of rolling contact bearing , Ball bearing Roller bearing, bearing designation, bearing installation. Application of bearing. Basic principle of Hydro dynamic and Hydro static bearing. Bearing modulus and Bearing characteristics number.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **601**
NAME OF THE COURSE: **DESIGN OF MACHINE ELEMENTS**

PAPER CODE:6162

REFERENCE BOOKS

1. Machine Design by Sharma and Agrawal.
2. Machine Design by R.K. Jain.
3. Machine Design by Shigley..
4. Machine Design by R S Khurmi
5. Introduction to Machine Design by Bhandari Tata Mcgraw Hill
6. Machine Design by Pandya and Shah

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE: **611**
NAME OF THE COURSE: **AUTOMOBILE ENGINEERING**

PAPER CODE:6163

S.NO	CONTENT
1	**Introduction:** Meaning of automobile, elements of automobile, classification of automobile, layout of chassis, various operating systems used in automobile.
2	**Auto Engines:** Meaning of I.C. Engines, Classification on the basis of cycle, fuel used, ignition system, number of cylinders, number of strokes etc. Otto/ Diesel cycles. Two stroke and four stroke engines, merits and demerits, scavanging comparison of petrol and diesel engines. Cooling systems, firing order. Valve timing diagrams. Engine rating. Lubrication, factors affecting lubrication, Lubrication systems, Fuel Supply system, fuel pump - SPU electric pump. Carburettor, air fuel ratio, Solex and amal carburettor.
3	**Auto Electric System:** Wiring diagram of a car and functions of various components used in the electric circuits, function and working principle of a starter and generator, function of voltage-current regulator, ignition timing, spark plugs- their classification, gap setting and common ignition troubles, their causes and remedies . Automobile battery - construction and working, electronic ignition system of modern vehicles.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE; 611
NAME OF THE COURSE: **AUTOMOBILE ENGINEERING**

PAPER CODE: 6163

S.NO	CONTENT
4	**Transmission System:** Clutch : necessity, function of its components, Types –single & multi plate and centrifugal clutches, cluth actuating mechanism and fluid flywheel. Gear Boxes : necessity, Types of gear boxes and their working. Importance of gear shifting mechanism, gear box troubles, their causes and remedies.
5	**Final Drives System:** Drive mechanism in cars, purpose and working of propeller shaft, construction of propeller shaft. Types of universal joints. Rear axle assembly : function of differential - constructional features and working. Arrangement of semi floating and fully floating rear axle, and their troubles.
6	**Braking system:** Introduction, classification of brakes, construction & working of mechanical brake, hydraulic brake, Electric brake , advantages and disadvantages of each type of brakes, Servo brake system.
7	**Front Axle and Steering:** Function of front axle, axle type, wheel alignment and its elements toe- in, toe -out. King pin inclination. Ackerman steering principle. Camber and castor angle . Elements of steering - types and working ,Under and over steering, power steering and advanced steering systems.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER** COURSE CODE: **611**
NAME OF THE COURSE: **AUTOMOBILE**: **ENGINEERING**

PAPER CODE: 6163

S.NO	CONTENT
8	**Frame and Suspension:** Frames : necessity, function, Classification, suspension system, types, leaf, coil spring. Telescopic shock absorber. Air suspension, independent suspension system. Tyres : structure of tyre section, rating of tyres, tyre- pressure measurement, material and specification. Tyre wear and remedies.
9	**Miscellaneous:** **(i) Maintenance of Vehicles :** need, classification maintenance procedure of engine, transmission system, electrical system, braking system and steering mechanism. **(ii) Garage and Service Station:** Types, layout, equipment tools and service procedure. **(iii)Exhaust Gas, Pollutants:** Their hazards and controls with reference to motor vehicle act. Motor Vehicle act, registration of vehicles, driving license and Traffic Signals.

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **611**

NAME OF THE COURSE: **AUTOMOBILE ENGINEERING**

PAPER CODE:6163

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Study of automobile chassis and function of various components.
2	Study of various components used in auto vehicles. (a) Engine (b) Transmission system (c) Final Drive (d) Braking system (e) Electrical system (f) Steering Mechanism
3	Study of various elements of scooter/ car/bus servicing.
4	Engine tuning and adjustment for smooth, idle speed of a scooter/moped/ motor cycle/ car etc.
5	Starting troubles and their rectifications.
6	Rectification procedure for : (a) Air bleeding. (b) Brake adjustment. (c) Problems in Carburettor. (d) Wheel alignment.
7	Battery, servicing and charging.
8	Repair of punctured tyre and re-treading of tyres.
9	Study of auto servicing centre. (a) Layout (b) Instruments/ Tools used (c) Servicing procedures.
10	Visit of a local auto service centre and prepare a report in respect of : (a) Layout (b) Instruments/ Tools used (c) Servicing/ Reconditioning/ Maintenance procedure.
11	Collect specifications for 2/3/4 Wheeler and prepare a comparison table and their manuals.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **611**
NAME OF THE COURSE: **AUTOMOBILE ENGINEERING**

PAPER CODE:6163

REFERENCE BOOKS

1 Automobiles Engineering Vol. I & I I by Dr. Kirpal Singh. (Standard Publisher)
2 Automobiles Engineering by R.S. Gupta (Satya Prakashan)
3 Automobile machanism by Joseph Heither
4 Automobile Engineering by R. P. Sharma (Dhanpat Rai & Sons)
5 Automobile Mechanism by William H. Crouse
6 I.C. Engines by Dr. A.C. Rad and S.B. Bechar
7 Automobile Engineering- T.R. Banga & Nathu Singh (Khanna Publicers)
8 Automobile Engg. – RB. Gupta
9 Automobile Engg. – K.M. Agrawal (Vol. I & II)
10 Automobile Engineering by Prof. S.M. Pande and K.K. Jain (Deepak Prakashan, Morar Gwalior)
11 IS: 202-1602-1960 Code for testing of variable speed I.C. Engines for automobile purpose.
12 IS: 1603-1960 Performance of variable speed I.C. Engines for automobile purpose.
IS : 1634-1964 Helical springs for automobile suspension.
13 IS : 2742-1964 Automobile brake lining.
14 IS : 3511-1966 Cylinder bore diameters for I.C. Engine.
15 IS : 4552-1963 Portable Jacks for automobile, Mechanical and hydraulic.
16 IS : 5423-1969 General requirements for hydraulic shock absorbes for automobile
17 suspension, direct acting telescope type.
IS : 5791-1970 Technical supply conditions for piston ring for IS Engines.
18 IS : 4974-1963 Grease nipples, small
19 IS : 844-1962 Screw drives.
20 IS : 2028-1963 Open jow Spanners.
21 IS : 2030-1971 Box Spanners.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

COURSE CODE: **621**

NAME OF THE COURSE: **REFRIGERATION & AIR CONDITIONING**

PAPER CODE:6165

S.NO	CONTENT
1	**Introduction to Refrigeration:** History of refrigeration, meaning and need of refrigeration, difference between refrigeration and Cryogenics, production of refrigeration by various methods. Refrigeration systems and their classification on the basis of use, size and application.
2	**Thermodynamics of Refrigeration:** Revision of I and II law of thermodynamics, comparison between heat engine, heat pump and refrigerator using heat reservoir, heat source, sinks & work. Unit of refrigeration, refrigeration effect, work input, co-efficient of performance, Reversed carnot cycle with gas and vapour as working substance. P-V, T-S and schematic diagrams. Calculation of refrigeration effect, work C.O.P and Heat rejection. Practical difficulties with carnot cycle. with gas and vapour as working substance. Vapour compression refrigeration cycle its schematic diagram and representation on P-V,T-S and P-H diagrams. Wet, dry and superheated vapour compression. Use of tables and charts of common refrigeration for calculating work input, refrigeration effect and C.O.P deviation of actual vapour compression system form, theoretical cycle and reasons for deviation. Effect of sub-cooling and superheating on vapour compression system.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

COURSE CODE :621

NAME OF THE COURSE: **REFRIGERATION & AIR CONDITIONING**

PAPER CODE:6165

S.NO	CONTENT
3	**Basic Components of Vapour Compression Refrigeration Systems:** Basic components of vapour compression refrigeration system and their function- compressor, condensor, expansion device and evaporator. Compressor : Classification, reciprocating- open and hermetically sealed rotary, and their field of application. Working of single and double acting reciprocating compressor. Working of hermetically sealed compressor. Condensor : Types (Water cooled, air- cooled evaporative) and their field of application and brief description. Expansion: Types of evaporators (Dry expansion and flooded type, and principle of their working and application.
4	**Vapour Absorption Refrigeration System:** Comparison between vapour compression and vapour absorption system, the theoretical and practical vapour absorption system, Lithium bromide- water absorption system. Three fluid system. (Electrolux systems)
5	**Properties of Commonly Used Refrigerants:** Definition, primary and secondary refrigerants, designation of refrigerant, examples of each type. Desirable properties of good refrigerant Azeotropic mixtures. Environmental problems related to halogenated hydrocarbons as refrigerants. New developments.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE :621
WITH NAME OF THE COURSE: **REFRIGERATION & AIR CONDITIONING**
PAPER CODE:6165

S.NO	CONTENT
6	**Refrigeration Plants:** Layout and working of Ice plant, cold storage. Water cooler and household refrigerator.
7	**Refrigeration Fittings, Tools, Charging and Leak Detection:** Tubing, Materials heat treatment specifications. **Tools:** Use and types of cutter, spring and mechanical bender-flaring and swaging tools pinch of tool, wrenches, Pliers etc. **Fittings:** Flared tube fittings, unions, elbows tee. **Joints:** Making soldered and brazed joints. Installation and removal of servicing gauge and testing manifold: Working of suction and discharge compressor service values. **Charging of Refrigerant:** evacuating a refrigeration system, removing, refrigerant form a refrigeration system leak detection methods.
8	**Introduction to Air Conditioning :** Meaning of air conditioning, application of Air conditioning in theatres, community halls, industry, restaurants, hospitals and windows air conditioner.
9	**Psychometry:** psychometric - definition, terminology, psychometric charts and tables, using psychometric charts for solving simple problems.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

COURSE CODE : 621

NAME OF THE COURSE: **REFRIGERATION & AIR : CONDITIONING**

PAPER CODE:6165

S.NO	CONTENT
10	**Air Conditioning Systems:** Central and unit air conditioning, residential and commercial air conditioning system. Types of fans and ducts - air distribution systems. Thermal insulator, methods and insulation cladding.
11	**Maintenance and Repairing of Refrigeration and Air Conditioning Units:** Fault location in vapour compression system and air conditions. Repair and maintenance of house hold refrigerators. Water coolers and air conditioners.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER** COURSE CODE: **621**

NAME OF THE COURSE: **REFRIGERATION & AIR CONDITIONING**

PAPER CODE: 6165

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Handling and use of tools such as- Tube cutter, tube bender, (Spring and mechanical type). Flaring and Swaging tool, wrenches, pliers, service valves, service gauges, preparation of soldered and brazing joints.
2	Study of water cooler with respect to (a) Refrigerant used and flow path. (b) Electric circuit (c) Water flow path (d) Specification of main components used. (e) Capacity of the unit.
3	Study of packaged/ Window/ Air conditioner with respect to- (a) Capacity. (b) Electric circuit (c) Air flow path. (d) Specification of main components used. (e) Refrigerant used.
4	Study of Ice-plat/ refrigeration cold storage with respect to- (a) Electric circuit (b) Refrigerant used and its flow path. (c) Capacity. (d) Specification

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER** COURSE CODE: **621**

NAME OF THE COURSE: **REFRIGERATION & AIR CONDITIONING**

PAPER CODE:6165

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
5	Leakage detection using ; (a) Soap and water. (b) Halide torch. (c) Vacuum method. (d) Pressure method.
6	Operating service valves and gauge manifold.
7	Removing refrigerant from systems.
8	Charging/Recharging the system refrigerator, water cooler, air conditioner.
9	Determination of refrigeration capacity. Power input, C.O.P of the given unit available in the institution.
10	Testing refrigeration and air conditioning system control components for proper functioning and replacement. (a) Capacitor (b) Starting and running windings of hermetically sealed compressor. (c) Overload (d) Relay (e) LP and HP (f) Thermostat.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **621**

NAME OF THE COURSE: **REFRIGERATION & AIR CONDITIONING**

PAPER CODE: 6165

REFERENCE BOOKS.

1 Refrigeration and Air Conditioning by C.P. Arora (Tata Mc Graw Hill)

2 Ashrae Guide and Data Book by Ashrae (Ashrae)

3 Andels Refrigeration and Air Conditioning Guide. by E.P. Anderson (Tarapowala)

4 Practical Refrigeration

5 Refrigeration and Air Conditioning by A.S. Sarao & P.C. Gaabi (Satya Prakashan)

6 Modern Refrigeration Practice by G.P. King (McGraw Hill)

7 A Course in Refrigeration & Air Condition by S. Lomkkundwar & S.C. Arora (Dhanpat Rai & Sons)

8 Refrigeration and Air Conditioning by R.C. Jorden & S.B. Priester (Prentice Hall)

9 Basic Refrigeration and Air Conditioning by D. Hazre & D.N. Chakravarty (Dhanpat Rai & Sons)

10 Principles of Refrigeration by R. W. Marsh (Taraporwala)

11 Refrigeration and Air Conditioning by P.L . Ballancey. (Khanna Publishers)

12 Principles of Refrigeration by D.P. Gupta Rajdhani.

13 I.S. : 1476 - 1971 Specification for Domestic Refrigerators (Mechanically Operated) by Indian Standard Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi- I (I.S.I)

14 I.S. 1391-1960 Room Air Conditioner by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi -1 (I.S.I)

15 I.S. : 1474-1959 Comm. Refrigerator . by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I)

16 I.S. : 1474-197 1 Self Contained . by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I)

17 I.S. Drinking Water Coolers. by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I)

18 Refrigeration & Air Conditioning. by R.C. Patel.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE: **622**
NAME OF THE COURSE: **POWER PLANT ENGINEERING**
PAPER CODE:6166

S.NO	CONTENT
1	**Steam Power Plant:** Energy conversion in a thermal power station. Limitations on conversion of heat into work, direct conversion devices, central power station, industrial power station, captive power station, advantages. Classification of power station on the basis of prime-movers. Elements of steam power plant, function of each element- generating unit, prime mover, auxiliary equipment and turbo generator. Revision & Improvement of thermal efficiency of Rankine cycle by lowering exhaust pressure, increasing boiler pressure and superheating of steam. Simple problems on Rankine efficiency. **Reheat cycle:** Representation on T-S and H-S planes, flow diagram and advantages. Simple regenerative cycle: flow diagram, representation on T-S and H-S planes, bleeding and feed water heating and pumping.
2	**Steam Generators:** Classification according to working pressure Accessories - Super heater, economizer, pre-heater and draft equipment, superheat control methods, pulverized fuel- necessity, storing system. High pressure boiler in modern steam power plant need, features and functions of Velox, Benson, Lamaunt, Leoffler high pressure boiler.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE: **622**
NAME OF THE COURSE: **POWER PLANT ENGINEERING**
PAPER CODE :6166

S.NO	CONTENT
3	**Steam Primemover:** Steam nozzle-Types, velocity of steam at outlet, weight of discharge, area of cross- section at throat and outlet, critical pressure ratio, nozzle efficiency, concept of primemover, steam turbine- Revision of steam turbine in terms of principle of working, methods of compounding and governing, losses in steam turbines, lubrication system of steam turbines.
4	**Condensing Unit:** Steam Condenser, functions, type-jet and surface. Limitations and advantages, elements of condensing unit-cooling towers.
5	**Steam Power Station Control and Safety:** Effect of load variation on shaft speed, steam admission, valve opening, steam flow rate, steam pressure and combustion control system. Necessity of controlling factors in load variation, control system (area system, centralized control system) functions of annunciator panel system, basic elements of control system, controls and instruments located in a modern central station. Control room, records and their purpose, log sheets or log book. .

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE: **622**
NAME OF THE COURSE: **POWER PLANT ENGINEERING**
PAPER CODE :6166

S.NO	CONTENT
6	**Nuclear Power Stations:** Nuclear reactions - fission, fusion, mass defect, binding energy, chain reaction, types of nuclear materials - fissile materials, fertile materials, process of conversion of fertile materials, breeding moderation. Nuclear reactor - Function- elements of a nuclear reactor- Reacted core, moderator, thermal - Shielding reflector, reactor vessel, fuel, coolant flow, control roads, biological shielding coolants (Caseansnon-boiling liquid, boiling liquid) Fluids - Helium, Co_2 , O_2 under pressure, pressurised water (Ordinary, heavy) liquid metals (Li, Si, Pb, Na) and their alloys, boiling water. Operation - Fast reactors, thermal reactor, breeding reactor. Nuclear fuel - Heterogeneous, Homogeneous. **Moderator:** Water moderator, heavy water moderator, graphite moderator and Berylling moderator. Health hazards in nuclear power station- Unit of radiation safe and dangerous zones of radiations, safety precautions in a nuclear power station- Medical requirements Entry requirements: In contamination zones, precaution during changing of fuel. Nuclear waste disposal.
7	**Diesel Power Plants:** Advantages and disadvantages as a primemover for power generation, essential components of diesel power plant and function. Cooling and lubrication system, fuel injection system- Basic requirements, fuel injection system -common rail system, individual pump system, distribution system, data recording, performance.

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DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**
COURSE CODE: **622**
NAME OF THE COURSE: **POWER PLANT ENGINEERING**
PAPER CODE :6166

S.NO	CONTENT
8	**Gas Turbine Powers Plants:** Advantages of gas turbines over I.C. Engine as prime movers, Brayton or Joule cycle, schematic diagrams for open and closed cycles, representation of cycle on P.V. and T.S. diagram. Thermal efficiency in terms of terminal temperature and pressure, effect of pressure ratio on thermal efficiency, advantages and disadvantages of open and closed cycle gas turbines, important components of a gas turbine power plant, methods of improving thermal efficiency, essential auxiliaries and controls of a gas turbine power plant, fuels for gas turbines.
9	**Hydro Electric Plants:** Types, Comparison of low, medium and high heat plants, elements of hydro power plants, governing of turbines, performance of water turbines, site selection.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER** COURSE CODE: **622**
NAME OF THE COURSE: **POWER PLANT ENGINEERING**

PAPER CODE:6166

LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Study of constructional and working details of : (a) Simple steam power plant. (b) Nuclear power plant. (c) Gas power plant. (d) Diesel power plant. (e) Hydro electric plant.
2	Study of controls provided in power plants listed above.
3	Draw balance sheet for diesel engine.
4	Performance and characteristics of steam/ hydraulic turbines.
5	Visits of various power plants located in Madhya Pradesh and submit report in terms of : (a) Detailed layout (b) Capacity. (c) Elements of each unit. (d) Control systems provided. (e) Berometers which are being controlled. (f) Doses occuring in various units. (g) Maintenance of schedule. (h) Lubrication systems, uses.

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **622**

NAME OF THE COURSE: **POWER PLANT ENGINEERING**

PAPER CODE:6166

REFERENCE BOOKS

1 Course in Power Plant Engineering By S.Domkundwar.

2 A Course in Power Plant Engineering By T. Morse.

3 A Course in Power Plant Engineering By Nagpal.

4 A Course in Power Plant Engineering By Agrawal.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,BHOPAL
DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **612**

NAME OF THE COURSE: **CAD/ CAM**

PAPER CODE :6164

S.NO	CONTENT
1	**Introduction to CAD/ CAM :** (i) Automation and its types (ii) Definitions : CAD,CAAD CAM, CIM and CAE (iii) Concept of CAD/CAM (iv) Computers in industrial Manufacturing (v) General Design procedure and application of computers in it. (vi) Benefits of CAD/CAM.
2	**Hardware of CAD/CAM System** (i) Basic structure (ii) Hardware components of CAD workstations and their functions: CPU, Memory devices, input devices, display devices, output devices and storage devices (iii) Hardware components of CAM system and their functions: CNC controller and CAD interfacing, CNC components. Conveyers and robot units (iv) Functions of each hardware unit in CAM. (v) Block diagram of integrated CAD/CAM system.

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S.NO	CONTENT
3	**Introduction to CAD software:** (i) Block diagram of graphics software configuration (ii) Functions of a graphic package (iii) 2D transformation translation, rotation and scaling with numerical examples (iv) 3D Modeling: Wire frame and solid type.
4	**Introduction to Conventional Numerical Control:** (i) Definition of NC (ii) Basic components of an NC system : Program, MCU and Machine tools (iii) The NC procedure (iv) NC coordinate systems, fixed zero and floating zero, Absolute and incremental positioning (v) NC motion control systems (vi) Components of MCU, Open and closed loop axis positioning systems (vii) Applications of numerical control in Machine Tools (viii) Advantages of NC systems
5	**Introduction to NC Programming:** (i) NC Part program and different codes used in it: N,G,M,F,S,T codes and co-ordinates (ii) Writing Program blocks using NC program codes (iii) Manual and Computer assisted part programming (iv) Introduction to NC part programming languages like APT Different statements in APT language and writing program through it

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S.NO	CONTENT
6	**NC Control technology:** (i) Different type of computer controls : CNC, DNC and Adaptive (ii) General Configuration, functions, and advantage of CNC, straight and hybrid CNC (iii) General Configuration, types, functions, and advantage of DNC, BTR and Special Machine control unit DNC (iv) Introduction, types and benefits of adaptive control, ACC and ACO systems

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LIST OF EXPERIMENTS

S.No.	EXPERIMENT
1	Study of CAD Hardware system using physical and visual aid
2	Auto CAD commands and their applications in various types of designs/ drawings. ten/fifteen experiments
3	Solid modeling using parametric software
4	Demonstration of CNC machine for identifying machine zero, drive systems, safety precautions, and dry run of demo part programme
5	Tool setting, Job setting , part programme execution on CNC machine.
6	Material job handling using Robot system and conveyor assembly.

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REFERENCE BOOKS

1 CAD/CAM Computer- Aided Design and Manufacturing by M.P. Groover, & E.W. Zimmer, Sr. (Prentice-Hall of India pvt. Ltd. (EEE), New Delhi, 1986) Inside Auto CAD by Deniel

2 Raker and Harbest Rice (BPB Publications, Delhi (Latest edition)
Introduction to Computer Aided Drafting by Donald D. Voisinet (2nd fd.) McGraw Hill.

3 BPB Publications, Delhi. by Mastering Auto CAD (BPB Publications, Delhi) Illustrated Auto CAD by T.W. Berghauser and P.L. Schlieve.

4 Numerical Control by Marthin (E.L.B.S.)

5 Understanding CAD/CAM- Design with Computer by D.J. Bowman, and R.N. MC- Dougal

6 (BPB Publications, Delhi) .

7 Numerical Control . by Child.
CAD/CAM by Kuldeep Sareen & Chandadeep Grewal (S,Chamd & Co, Delhi) Computer-

8 Aided Design Engineering & Manufacturing (CRC Press)

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SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **604**

NAME OF THE COURSE: **PROJECT**

S.NO	CONTENT
1	Specification on Minor Projects : To prepare a write up or feasible report containing not more than 1500 words, using appropriate diagrams & Illustrations, and in simple language to be understood by non- technical readers, about an engineering topic .Suggested Topics : Feasibillty of non conventional sources of energy for a particular application. Solar heaters (Gobar gas Plant) Technicians role in village feasibility of certain projects.
2	Prepare a comparative study report about alternative materials available for a particular application.Suggested Topics : Electrical conductors.Cutting tools for high speed, machining.Furniture making Cooking utensile.
3	Prepare a technical paper to be read to the rest of the class, about the process of conversion of raw material in to a finished product.Suggested Topics : Rubber tyres. Production of mechanical engineering products. Lubricating oils Production of plastic buckets.Production of stainless steel products.Detergents. Products involving special welding or costing processes.

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SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **604**

NAME OF THE COURSE: **PROJECT**

S.NO	CONTENT
4	Prepare a survey of equipment, available for a particular engeering situation, make a comparative study and suggest a suitable choice.Suggested Topics : Material handling equipment Machine tool for given product.Measuring instruments.
5	Prepare a simple machine or component as per given drawing specification. Suggested Jobs : A simple drilling machine model.A punching Machine. An inexpensive hardness tester.Simple materials testing equipment.
6	Reclaiming a worn out component or equipment and putting it to use. Suggested Job : A worn out cam shaft bearing assembly.A rejected I.C. Engine used in a motor cycle.Re- conditioning a discarded pump.
7	Contruction of simple laboratory equipment/ teaching aids.

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SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **605**

NAME OF THE COURSE: **PROFESSIONAL ACT IVITIES**

opic No	**Contents**
01	**Industrial Visits** Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.(**2 visits)** Following are the suggested types of Industries/ Fields - i) Automobile manufacturing / auto component manufacturing units to observe the working of SPM ii) Refrigeration and air conditioning manufacturing / servicing units / industries / workshops iii) Automobile service stations for four wheelers iv) Co-ordinate measuring machine to observe its construction working specifications and applications. v) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc. vi) Wheel Balancing unit for light and/or heavy motor vehicles. vii) Food processing unit. viii) Textile industry machinery manufacturing / servicing units. ix) Hydro electric and Thermal power plants. x) Engine testing, exhaust gas analysis and vehicle testing xi) PWD workshop.

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SEMESTER: **SIXTH SEMESTER**

COURSE CODE: **605**

NAME OF THE COURSE: **PROFESSIONAL ACT IVITIES**

Topic No	Contents
02	**The Guest Lecture/s** From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work a) Electronic fuel injection systems b) Exhaust gas analysis. c) Vehicle testing. d) Transducer application in automobiles. e) Environmental pollution & control. f) Vehicle aerodynamics & design. g) Earth moving machines. h) Automobile pollution, norms of pollution control. i) Biotechnology j) Nanotechnology k) Rapid prototyping l) Programmable logic controllers m) TQM n) MPFI o) Hybrid motor vehicles p) Packaging technology q) Appropriate technology r) Six sigma systems s) LPG / CNG conversion kit.