



**DR. A P J ABDUL KALAM UNIVERSITY,
INDORE**

SYLLABUS

For

DIPLOMA MECHANICAL ENGINEERING

(SECOND YEAR, 3rd SEM)

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Diploma Mechanical Engineering

List of Subject (Second Year, IIIrd Sem)

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Unit 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.

Unit 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

Unit 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.

Unit 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

Unit 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.

Unit 6: Iron- Carbon Equilibrium 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.

Unit 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, spheroidising and patenting.

Unit 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 steels as per B.I.S. codes.

Unit 9: Non- Ferrous Metals and Alloys : Copper : Its Properties and uses
Copper 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.

Unit 10: Non- Metallic Materials : introduction to Ceramic Refractory, Rubbers Insulators and Lubricants

Unit 11: Plastics: characteristics, classification, commonly used thermo-setting and thermoplastic - their properties and uses. Ingredients for processing plastics. Plastic processing methods different methods.

Unit 12: Powder Metallurgy:-Introduction and application. Description of process, manufacture and blending of metal powder compacting and sintering.

Unit 13: Metal Preservation: Corrosion meaning various mechanism effect of corrosion, methods of minimizing corrosion.

Unit 14: Modern Trends in Materials Engineering : New materials like FRP, Composites, synthetic fibers, synthetic wood. Super conductors.

REFERENCES

- 1 Engineering physical Metallurgy-By Prof. Y Lakhtin MIR Publishers Moscow
- 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 Engineering by K.M. Ralls, T.H. Courtney, John Wuff (Wiley Eastern New Delhi)
- 7 Physical Metallurgy 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) .

LIST OF EXPERIMENTS

01. Preparation of micro specimen.
02. To study micro structural characteristics of gray cast iron white cast iron and malleable cast iron.
03. To study effect of normalising, annealing on the hardness and microstructure of high carbon steel.
04. To study the effect of carbon and temperature on hardening of steel.
05. To study the effect of temperature on the properties during tempering of steel.
06. To study the effect of quenching media on hardness of steel.
07. To study the carbonizing and case hardening of steel.
08. Joining hardenability test and its industrial use.
09. To Study the microstructure of some important brasses and bronzes.
10. To observe the micro structural characteristics and other properties of various cast irons and prepare a report there of, for industrial uses.

Unit1. 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.

Unit 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.

Unit 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.

Unit 4. Mechanical Working : Introduction - hot and cold working, Principle of recrystallization.

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.

Unit 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, Electro-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.

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)

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	Blacksmith shop Tinsmith

	the help of Metal master machine.	
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

Unit 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.

Unit 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).

Unit 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)

Unit 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)

Unit 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, comparison with three phase induction motor. Synchronous generator (alternator) – Construction, principle of operation, speed and frequency, synchronous speed.

Unit 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. Electrodynamic 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, Piezo Electric and Photoelectric Transducers.

Unit 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 .

Unit 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).

Unit 9. ELECTRIC SAFETY

9.1 Electric shock and its prevention , effect of electrical current on human body, shock treatment, need of earthing.

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.

LIST OF EXPERIMENTS

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

NOTE : The list of the experiment given above, the student has to perform atleast 12 experiment.

Unit 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.

Unit 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)

Unit 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.

Unit 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.

Unit 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.

Unit 6. Application of Auto CAD: practice of assembly drawings using Auto CAD

Unit 7. Presentation: Block, creating layout, insert layout ,ploting/printing

Unit 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.

Unit 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 meshing, spur gear meshing.

Unit 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 $f(t) + f(u) + f(v)$, $f(t) f(u) = f(v)$ three scale alignment chart, graphical construction of a Z- chart, four variable relationship parallel scale alignment chart.

REFERENCES

- 1 Fundamentals of Engineering Drawing by Warren J. Luzadder (Prentice-Hall).
- 2 Mechanical Drawing by Giesecke, Mitchell Spencer, 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)

Drawing Sheets

S.No.	TOPIC	PRACT. SHEETS IN NOS.
1	Projection and multi views representation	02
2	Sectional views	02
3	Dimensioning, tolerance, machining and welding symbols	02
4	Production drawing	08
5	Pipe drafting	01
6	Gear Drawing	02
7	Graphs and charts	01
8	Computer graphics	05

Unit 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 modulus 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, modulus of resilience suddenly applied loads and impact loads.

Unit 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.

Unit 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.

Unit 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.

Unit 5. Bending Stresses in Beams : Theory of simple bending as assumptions made in simple bending theory position of neutral axis, surface moment or resistance. Modulus 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.

Unit 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.

Unit 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.

Unit 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.

Unit 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.

Unit 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.

Unit 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.

Unit 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.

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)

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.).

Professional Activities is not a descriptive course, as per conventional norms; therefore specific content for this course cannot be prescribed. It is a group of opened activities; where in variety of tasks are to be performed, to achieve objectives. However general guidelines for achieving the target and procedure for its assessment are given under the course content. As the student has to practice this course in all the six semesters, the guidelines given therein are common and applicable to each semester.

Objectives:

To allow for professional development of students as per the demand of engineering profession.

- To provide time for organization of student chapter activities of professional bodies) i.e. Institute of engineers, ISTE or Computer Society of India etc.)
- To allow for development of abilities in students for leadership and public speaking through organization of student's seminar etc.
- To provide time for organization of guest lectures by expert engineers/ eminent professionals of industry.
- To provide time for organization of technical quiz or group discussion or any other group activity.
- To provide time for visiting library or using Internet.
- To provide time for group discussion or solving case studies.
- To provide time for personality development of students.
- To provide time for working for social cause like awareness for environmental and ecology etc.

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

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.