Bharati Vidyapeeth Deemed University

College of Engineering, Pune- 411043

The Structure of the Curriculum: 2007 Course

B. TECH. MECHANICAL: SEMESTER- III & IV

Bharati Vidyapeeth University

College of Engineering, Pune

Department of Mechanical Engineering

Vision: To provide mechanical engineers capable of dealing with global challenges

Mission: Social transformation through dynamic education

Programme Educational Objectives (PEOs):

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

Programme Outcomes (POs):

a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems

b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes

c. To design and develop mechanical systems considering social and environmental constraints.

d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques

e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance

f. To know social responsibilities while doing professional engineering practice.

g. To become familiar with eco-friendly, sustainable and safe work environment.

h. To take into account professional ethics while designing engineering systems.

i. Able to work efficiently as a group leader as well as an individual.

j. To communicate in written and verbal form with subordinates and supervisors

k. To apply project and finance management techniques in multidisciplinary environments.

l. To create interest for higher education and updating the knowledge.

B. TECH. MECHANICAL: SEMESTER- III

Total Duration: 30 Hrs./ week
Total Marks: 750

Course Code	Course	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total Marks
		L	P/D	T	TH	UT	TW & Pr	TW & Or	
K 60201	Strength of Machine Elements	04	02	--	80	20	--	50	150
K 60202	Applied Thermodynamics	04	02	--	80	20	--	50	150
K 50261	Industrial Electronics & Electrical Technol.	04	02	--	80	20	--	50	150
K 60241	Manufacturing Process	04	--	--	80	20	--	--	100
K 60203	Fluid Mechanics	04	02	--	80	20	--	50	150
K 60242	Workshop Prac.-III	--	02	--	--	--	50	--	50
	Total	20	10	--	400	100	50	200	750

B. TECH. MECHANICAL: SEMESTER- IV

Total Duration: 33 Hrs./ week
Total Marks: 750

Course Code	Course	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total Marks
		L	P/D	T	TH	UT	TW & Pr	TW & Or	
K 70208	Engineering Mathematics - III	04	--	01	80	20	--	--	100
K 60204	Internal Combustion Engines	04	02	--	80	20	50	--	150
K 60205	Theory of Machines- I*	04	02	--	80	20	--	50	150
K 60243	Material Science & Engineering Metallurgy	04	02	--	80	20	--	50	150
K 60206	Computer Aided Drafting & Machine Drawing*	04	04	--	80	20	50	--	150
K 60244	Workshop Prac.-IV	--	02	--	--	--	50	--	50
	Total	20	12	01	400	100	150	100	750

*Subject with Four hours Theory Paper

Rules for Conducting Tests

Mode of the test

- In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.

- To calculate these marks following procedure is followed:

  i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.

  ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.

  iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.

  iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.

  v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.

  vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

- Paper pattern for tests

  i) All questions will be compulsory with weightage as following

  Question 1 - 7 marks

  Question 2 - 7 marks

  Question 3 - 6 Marks

ii) There will not be any sub-questions.

- For granting the term it is mandatory to appear for all three tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

Department of Mechanical Engineering

STRENGTH OF MACHINE ELEMENTS

(Course No: K60201)

Designation of Course	**Strength of Machine Elements**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Marks
Tutorials:- -- Hours/ Week	Unit Test	20 Marks
	T. W. & Or.	50 Marks

Course Prerequisites:-	1. Engineering Mathematics 2. Engineering Mechanics
Course Outcomes:-	1. Calculate stress and strain in machine components 2. Find out maximum load carrying capacity under tensile, compressive, torsion tests 3. Assess different types of failures 4. Use shear force and bending moment diagrams for different loading conditions in beams and shaft 5. Use analysis in simple machine elements 6. Calculate diameter of joints

Course Contents

Unit 1	**Simple Stresses & Strain in Machine Parts**	**(08 Hrs.)**
Concept of stress & strain, types of stresses, strains – linear, lateral, shear, thermal, volumetric, hooks law, Poison's ratio, modulus of elasticity, modulus of rigidity, bulk modulus, stress-strain diagram for ductile & brittle material, yield strength, ultimate strength, buckling, impact loading, suddenly applied loading, Thermal stresses in machine elements.		
Unit 2	**Engineering Materials**	**(08 Hrs.)**
Mechanical properties of engineering materials, creep, stress concentration, selection of materials, cast iron, BIS system of designation of steel, plain carbon steel, overseas standards, cast steel, aluminum alloys, die casting alloys, weighted point method.		
Unit 3	**Principle Stresses**	**(08 Hrs.)**
Normal & shear stresses & strain on any oblique plane, concept of principle planes, derivation of expression of principle stresses & maximum shear stresses, position of principle planes & planes of maximum shear, graphical solution using Mohr's circle, combined effect of axial force, bending & torsion. Theories of Failure: Maximum normal stress theory, Maximum shear stress theory, Maximum distortion energy theory, Maximum strain theory, Maximum strain energy theory, their application & limitation to engineering material, composite member design.		
Unit 4	**Shear force Diagram & Bending Moment Diagram of Shafts and Beams**	**(08 Hrs.)**
SFD & BMD of shaft with different end conditions, simply supported, cantilever, and overhang, with all types' loads, concentrated load conditions, torsional deflection of shaft, and lateral deflection of shaft by Maculley's method, moment area method, Castigliano's theorem.		

Unit 5	Stress Analysis of Knuckle and Cotter Join	(08 Hrs.)
Bending of curved bars, stresses in ring, chain link, crane hook, eccentric loading, design of knuckle & cotter joint & chain link.		
Unit 6	**Threaded and Riveted Joints**	**(08 Hrs.)**
Basic types of screw fastenings, uniform strength bolts, ISO metric screw threads, Eccentrically loaded bolt joint load perpendicular to bolt axis, eccentric load on circular base, cylindrical bolts, turn buckle design		

Term work

The Journal containing the record of following:

1. Experiment on Tension test on M.S. bar.
2. Experiment on Compression test on M.S. bar.
3. Experiment on Shear test on M.S. bar.
4. Experiment on Torsion test on M. S. bar.
5. Experiment on Impact test.

Drawing file containing two half imperial sheets:

1. Drawing sheet of SFD – BMD of shafts using computer.
2. Drawing sheet of Mohr's circle.

Any two assignments based on above syllabus.

Text Books/ Reference Books

1. Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing Co. Ltd. 1985
2. James Gere, Mechanics of Materials, Thomson Learning
3. S Ramamrutham, Strength of Materials
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
5. J. E. Shigley, Mechanical Engineering Design, McGraw Hill

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

APPLIED THERMODYNAMICS
(Course No: K60202)

Designation of Course	**Applied Thermodynamics**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Hours
Tutorials:- -- Hours/ Week	Unit Test	20 Marks
	T.W. & Or.	50 Marks
Course Prerequisites:-	1. Knowledge of basic concept of thermodynamics 2. Knowledge of basic gas laws 3. Knowledge of pumps and compressors	
Course Outcomes:-	1. Able to understand 2nd law of thermodynamics and its applications 2. Able to calculate Air Standard efficiency of petrol and Diesel cycle. 3. Able to draw heat balance sheet of boiler. 4. Able to understand working of Single and Multistage air compressor. 5. Able to understand working of rotary compressor. 6. Able to analyse flue gas analysis	

Course Contents

Unit 1	**Second Law of Thermodynamics and Entropy**	**(08 Hrs.)**
Limitations of first law of thermodynamics, heat engine, refrigerator and heat pump, Kelvin-Planck's statement & clausius statement, equivalence of Kelvin-Planck's and clausius statements, perpetual motion machine of second kind, carnot cycle & carnot heat engine. Entropy as a property, second law analysis for entropy, clausius inequality, principle of increase of entropy, irreversibility.		
Unit 2	**Air Standard Cycles and Vapour Processes**	**(08 Hrs.)**
Concept of air standard cycles, assumptions, Otto, diesel & dual cycle, thermal efficiency, mean effective pressure, comparison of Otto, diesel & dual cycle, actual cycle, deviation from theoretical cycle, relative efficiency. Non flow and steady flow vapor processes, change of properties, work transfer & heat transfer, use of P-V, T-S, H-S diagrams for steam, determination of dryness fraction, study of calorimeters.		
Unit 3	**Steam Generators and Vapour Power Cycle**	**(08 Hrs.)**
Classification, constructional details of process and power boiler, boiler mountings and accessories, equivalent evaporation, boiler efficiency, energy balance, boiler controls, boiler draught. Carnot cycle using steam, ideal Rankin cycle, calculation of thermal efficiency, specific steam consumption, work ratio, comparison of Carnot and Rankin cycle, effect of superheat.		
Unit 4	**Single Stage Reciprocating Air Compressor and Multi Stage Reciprocating Air Compressor**	**(08 Hrs.)**
Uses of compressed air, classification, constructional details of single stage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical and actual indicator diagrams, method of improving volumetric efficiency. Need of multi staging, multi stage compressor, work done, volumetric efficiency, condition for maximum efficiency, intercooling, actual indicator diagram.		
Unit 5	**Rotary Compressor**	**(08 Hrs.)**

Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and rotodynamic compressors, static and total head, work done efficiencies, surging, and choking, stalling, characteristics curves for rotodynamic compressors. Selection of compressors for various applications.		
Unit 6	**Fuels and Combustion and Availability**	**(08 Hrs.)**
Mass fraction, mole fraction, combustion equation, theoretical air , excess and deficient air, stoichiometric and actual air to fuel ratio, analysis of products of combustion, gravimetric and volumetric analysis and their conversions, method to determine flue gas analysis - CO, CO2, O2, HC, NOx, smoke. High and low grade energy, available and unavailable energy, loss of available energy due to heat transfer through a finite temperature difference.		

Oral: Based on above term work.

Term Work

1. Term work shall consists of record of minimum eight experiments of the following:
2. Determination of calorific value using bomb calorimeter.
3. Demonstration to determine exhaust gas analysis by using any commercially available test rig.
4. Test on reciprocating air compressor to determine volumetric efficiency, isothermal efficiency and FAD.
5. Determination of dryness fraction using any commercial available test rig. Study of boiler mounting and accessories.
6. Study of package boiler / modern boiler.
7. Report on visit to any process industry, which uses boiler.
8. Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance sheet.
9. Performance test on rotary air compressor/ blower. Study of rotary type positive displacement compressor.

Text Books/ Reference Books

1. Y. Cengel & Boles, Thermodynamics -engineering approach, Tata McGraw Hill Publications.
2. C. P. Arora, Engineering Thermodynamics, Tata McGraw Hill Publications.
3. P. L. Ballany, Thermal Engineering, Khanna Publications.
4. Kothandarman & Domkundwar Thermodynamics & Heat Engines.
5. Rayner Joel, Engineering Thermodynamics, ELBS Longman.
6. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

INDUSTRIAL ELECTRONICS AND ELECTRICAL ENGINEERING
(Course No. K50261)

Designation of Course	**Industrial Electronics And Electrical Engineering**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	**Theory**	80 Marks
Practical: 02 Hours/ Week	**Duration**	03 Hours
Tutorials: -- Hours/ Week	**Unit Test**	20 Marks
	T.W. & Or.	50 Marks

Course Prerequisites:-	Basic knowledge of electronics, electrical and Motors.
Course Outcomes:-	1. Able to understand and apply knowledge of basic laws and theorems to solve simple electrical dc circuits. 2. Able to define basic terms of single phase and three phase ac circuits and supply systems. Draw vector diagram and solve simple numerical on ac circuits. 3. Able to describe fundamental concepts of magnetic and electromagnetic circuits. Explain principle of transformer and calculate efficiency and regulation of transformer 4. Able to draw power supply system layout, block diagram of SMPS, UPS. Know and use electrical safety rules. 5. Able to specify and select electronic components as per required application. 6. Able to specify and select suitable measuring instruments for required application

Course Contents

Unit 1	**D C Machines**	**(08 Hrs.)**
Construction, generator action, e.m.f. equations, types, shunt, series, compound generators (elementary treatment). Motoring action, types - Shunt and series, significance of back e.m.f., torque - speed equations, torque – armature, current speed – armature current, torque – speed characteristics, different methods of speed control for shunt and series motor, starters of DC motors. Applications Of D C motor		
Unit 2	**Three Phase Induction Motors:**	**(08 Hrs.)**
Concept of rotating magnetic field Principle of operation, slip, slip torque equation, , torque slip characteristics, Methods of starting of I M , relation between slip, of mechanical power developed and copper loss, efficiency of motor, applications of 3-phase I M Principle of working, construction and applications (descriptive treatment only) of. I) Single phase induction motors: Resistance split phase, capacitor split phase and shaded pole motors. ii) Special purpose motors: Stepper motors, servomotors, A.C. series motors, Universal motors.		
Unit 3	**Synchronous Machines :**	**(08 Hrs.)**
Alternators: Constructional features, salient pole and cylindrical type rotors, synchronous speed. Frequency of induced e.m.f. Equations, winding factors, regulation of an alternator. (Synchronous impedance method only). Synchronousmotors:Principleofworkingphasordiagram,effectofvariationof load and excitation, methods of starting, general application, applications as asynchronous condenser		

Unit 4	Study of Power Control Devices:	(08 Hrs.)
Construction and working of SCR, Triac, Power MOSFET, IGBT, Characteristics and, Triggering circuits using Diac / UJT, simple applications like Controlled rectifiers light dimmers, fan regulators. Study of UPS (Only block diagram)		
Unit 5	**Linear and Digital ICs**	**(08 Hrs.)**
Introduction to IC Op-Amp (like 741), ideal parameters, open loop and closed loop gain , Op-Amp with negative feedback as a small signal amplifier (e.g. Inverting and non-inverting configurations) Op-Amp as Instrumentation Amplifier, Audio Power Op-Amp. IC's like TBA 810, LM380, Op-Amp as comparator, Op-Amp as wave form generator (Square and ramp), case study of Waveform generator IC such as 8038 or XR 2206.Timing Circuits Using IC 555 as mono stable and a stable multi vibrator and its applications in Mechanical Engg., sequential timers. Binary and BCD adder, Subtractor, Study of flip-flops, shift registers, counters, applications of digital circuits such as staircase, traffic light, lift controller, sequential controllers, display devices like LED, LCD, opto- isolators and opto-couplers.		
Unit 6	**Industrial Applications:**	**(08 Hrs.)**
Advantage of electrical heating, various methods of heating a) Resistance heating: Requirements of heating element materials, various heating element materials, design of Heating elements. b) Induction heating: Core type furnace, Ajax - Wyatt furnace, coreless induction type furnace, high frequency Eddy current heating. Dialectical heating: General principles Resistance welding and arc welding transformers, storage welding, RF heating, ultrasonic method of testing of materials, principles at LASER and applications, Use of CRO as display devices for industrial application.		

List of Practical

The Term-work shall consist of record of following experiments (Any Eight) (4from Electronics and 4 from Electrical)

1. Study of UPS Systems: Instruments: UPS Kit, CRO, DMM Or
2. ControlledrectifierswingSCRwithUJTtriggeringforalampload.Instruments:Power–Scope,DMM
3. Applications of Op-Amp. Using741 (Any Two)
4. Square wave generators/ramp. Generator
   Instrumentation Amplifier
   Op-Amp as comparator and Schmitt trigger
5. Instruments: Dual trace CRO, Dual power supply, Function generator
6. Sequential timer using IC555 and square wave generator. Instruments: Power supply, Dual trace CRO, stop-watch. Application of logic gates (one bit comparator) and combinational circuits e.g. traffic lights
7. Combinational lock lift, control, code conversion
8. Shift registerIC7495anditsapplication a sequence generator OR
9. Experiment on CNC programming (to be conducted in workshop)
10. Speed control of D. C. shunt motor by armature voltage and flux control methods and study Of D.C. shunt motor starters
11. Load test on D. C. shunt motor Load test on D. C. series motors
12. Regulation of alternator by synchronous impedance method Load test on three phase induction motor
13. Regulation of alternator by direct loading method
14. Study of various single-phase Induction motor

Text Books/ Reference Books

1. Boylested and Nastellsky, Electronic Devices and Circuits–PHI

2. Malvino and other Digital Principles and Applications–McGraw Hill
3. Allen Mottershed, Electronic Devices and Circuits, PHI
4. Harish C, Raj: Industrial and Power Electronics, Umesh Publications Delhi
5. E Huges, Basic Electrical Engineering, PHI
6. C.S.Rangan, Sharma, Mahi Instrumentation Devices and system.WIE.
7. Curtis Johnson, Process Instrumentation, PHI
8. Grover and Zeimmers, CAD/CAM,PHI
9. PillaiS.K.,FirstcourseinElectricalDrives:WileyEasternHCottonElectricalTechnology
10. Open show Taylor: Utilization of Electrical Energy

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

MANUFACTURING PROCESSES
(Course No.K60241)

Designation of Course		**Manufacturing Processes**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	04 Hours/ Week	Theory	80 Marks
Practical:-	-- Hours/ Week	Duration	03 Hours
Tutorials:-	-- Hours/ Week	Unit Test	20 Marks
		T.W. & Or.	-- Marks

Course Prerequisites:-	Basic knowledge of workshop practice and fabrication techniques.
Course Outcomes:-	1. Able to understand different casting processes 2. Able to know different ho working and cold working processes 3. Able to understand different welding process 4. Able to understand different operations performed on lathe machine 5. Able to understand different drilling and milling operations 6. Able to get knowledge of abrasive machining and plastic moulding

Course Contents

Unit 1	**Expendable Mould and Permanent Mould Casting Processes:**	**(08 Hrs.)**

Sand casting, Types of pattern materials, pattern making allowances, core prints, Moulding sand- properties and testing, Hand and machine moulding, core, core boxes, core making melting and pouring, Melting furnaces- Cupola, fuel fired, electric arc, Induction furnaces, Cleaning, Finishining and heat treatment of castings, Defects in casting lost foam process, Shell moulding , Investment casting. Die casting low pressure perment mould castings hot and cold chamber processes, Centrifugal casting, Semi-centrifugal casting. Centrifuging, Continuous casting

Unit 2	**Hot & Cold Working Processes**	**(08 Hrs.)**

A) Hot working processes:

Principle, rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, effect of hot working.

B) Cold working processes

Cold rolling, swaging, forging extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, sheet metal, working- types of press, drives, different operations, and types of dies.

Unit 3	**Joining Process:**	**(08 Hrs.)**

a) welding process-

I) Arc weld – theory SMAW, GTAW, GMAW, FCAW, Submerged arc welding stud welding.

ii) Resistance welding- Theory, spot, seam, projection welding processes.

iii) Gas welding

iv) Friction welding, ultrasonic welding, thermit welding, electron beam and laser welding.

b) Use of adhesives for joining.

Classification of adhesives, types of adhesives and their applications, surface preparation and various joints

Unit 4	**Turning, Boring related Process:**	**(08 Hrs.)**

Introduction,function,types,constructionaccessoriesoperations,threadcutting,singleandmultistartthread cutting,differenttools,toolmaterials,ToolGeometry,conceptofspeed,feed,depthofcut,Introductiontoborin

gmachinesgeneralarrangementandnatureofworkdone		
Unit 5	**Drilling and Milling Machines:**	**(08 Hrs.)**
A) Drilling : Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process. B) milling machines: Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing. Gear train calculations for helical and cam milling		
Unit 6	**Abrasive Machining Process & Plastics & Plastic Moulding:**	**(08 Hrs.)**
Abrasive machining processes: Abrasive machining, abrasives -types, size and geometry, Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults, Honing, lapping, super finishing, buffing, burnishing process. Plastics & Plastic Moulding: Moulding characteristics of plastic, Moulding process- compression, transfer, and injection blow moulding. Mould design- Materials and construction, bulk factor, shrinkage, moulding parameters, moulding machines, extruders		

Textbooks/ Reference Books

1. Chapman W.A.J.: "workshop technology" volume I, II, III. ELBS.
2. Hajara choudhary S. K., Bose S. K.: "Elements of Workshop technology" – Volume I, II.
3. Begman: Manufacturing processes.
4. HMT: production technology. TMH Publishing Co. New Delhi.
5. Roy A. Lindberg: processes and metables of manufacturing fourth edition prentice Hall of India New Delhi.
6. Manufacturing process, P C Pandey

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

FLUID MECHANICS
(Course No. K60203)

Designation of Course	**Fluid Mechanics**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Hours
Tutorials:- - Hours/ Week	Unit Test	20 Marks
	T. W. & Or.	50 Marks

Course Prerequisites:-	Student should have knowledge of 1. Fundamentals of Mechanical engineering. 2. Analysis of forces and moments. 3. Laws of motion, kinetics and kinematics.
Course Outcomes:-	1. Able to understand behaviour of fluids 2. Able to use appropriate pressure measuring devices 3. Able to apply Bernoulli's energy equation 4. Able to distinguish between laminar and Turbulent flow 5. Able to calculate losses in the piping system 6. Able to verify dimensional analysis results

Course Contents

Unit 1	**Fluid Properties & Fluid Kinematics:**	**(10 Hrs.)**
Definition of fluid, Types of fluids, Viscosity, Compressibility, Vapour pressure, Surface tension, Capillarity, Velocity of sound, Mach number. Types of Flow – Steady, Unsteady, Uniform, Non-uniform, Laminar, Turbulent, One, Two & Three dimensional, Compressible, Incompressible, Rotational, Irrotational, Stream lines, Path lines, Streak lines, Velocity components, Convective & Local acceleration, Velocity potential, Stream function, Flow net.		
Unit 2	**Fluid Statics:**	**(06 Hrs.)**
Pressure at a point, Pascal's law, Devices for pressure measurement, Liquid pressure on plane & curved surfaces, Centre of pressure, Buoyancy & stability of floating & submerged bodies, Meta centric height.		
Unit 3	**Fluid Dynamics:**	**(08 Hrs.)**
Equations of motion, Continuity equation, Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to pitot tube, Venturimeter, Orifices, Orifice Meter, Triangular & Rectangular notch.		
Unit 4	**Laminar Flow & Flow around Immersed Bodies:**	**(08 Hrs.)**

Definition, Relation between pressure & shear stresses, Laminar flow through a circular pipe, Hagen Poiseuille equation, Fixed parallel plates, One fixed & one moving plate. Flow around Immersed Bodies: Lift & drag, Classification of drag, Flow around circular cylinder & Aerofoil, Development of lift on Aerofoil.		
Unit 5	**Flow through Pipes:**	**(08 Hrs.)**
Energy losses through pipe, Darcy Weisbach equation, Minor losses in pipes, Pipes in series & parallel, Equivalent pipe, Flow through siphon, Hydraulic power transmission through pipe.		
Unit 6	**Turbulent Flow & Boundary Layer:**	**(08 Hrs.)**
Definition of turbulent flow, Velocity distribution, Development of boundary layer on flat plate, Separation of boundary layer & methods of controlling. Dimensions of physical quantities, Dimensional homogeneity, Buckingham π theorem, Similarity, Important dimensionless numbers.		

Term Work

1. A journal containing record of any eight experiments of the following:
2. To find viscosity of liquids & its variation with temperature.
3. Study of pressure measuring devices.
4. Stability of floating body & optimum loading capacity.
5. Verification of modified Bernoulli's equation.
6. Calibration of Venturimeter.
7. Calibration of 'V' notch.
8. Study of minor losses due to pipe fittings.
9. Study of laminar & turbulent flows by Reynolds apparatus.
10. Study flow around immersed bodies by Hales haw apparatus.
11. Verification of friction factor for laminar & turbulent flow through pipes.

Oral

Based on above term work

Text Books/ Reference Books

1. Streeter V. L. & Wylie E. B., Fluid Mechanics, McGraw Hill International Book Co.
2. Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House.
3. Dr. P. N. Modi and Dr. S. M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulic Machines", Standard
4. Book House.
5. R. K. Rajput, Fluid Mechanics, S. Chand.
6. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, New Chand & Bros; Roorkee

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

WORKSHOP PRACTICE III
(Course No: K60242)

Designation of Course		**Workshop Practice III**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	-- Hours/ Week	Theory	-- Marks
Practical:-	02 Hours/ Week	Duration	-- Hours
Tutorials:-	-- Hours/ Week	Unit Test	-- Marks
		T. W. & Pr.	50 Marks

Course Prerequisites:-	Student should have basic knowledge of welding, soldering, Lathe Machine.
Course Outcomes:-	1. Able to perform different forging operations 2. Able to perform different operations on lathe machine 3. Able to handle different wood working tools and equipments to prepare the pattern 4. Able to perform joints with arc welding.

Course Contents

Each candidate shall be required to complete and submit the following term work.

Jobs

1. Forging and grinding of lathe tool with one knife and other end V one job.
2. Plain and taper turning one job.
3 .Making a pattern involving wood turning one job.
4. Welding (gas or arc) one job.

Journal and Demonstration

A journal shall consist of assignments based on M/C tools. These should include sketches and description as given below-(Any Five)

1. Mechanical test on weldment (To check tension. bend properties)
2. Plasma arc welding
3. At least one assignment on joining process
4. Demonstrations of lathe machine
5. Assignment on turning boring process
6. Demonstration of drilling machine
7. Assignment on drilling machine

Practical Assignment Scheme

A practical examination of three hours duration based on above term work shall be conducted at the end of semester.

Department of Mechanical Engineering

ENGINEERING MATHEMATICS – II

(Course No. K70108)

Designation of Course		**ENGINEERING MATHEMATICS – II**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	04 Hours/ Week	Theory	80 Marks
Practical:-	-- Hours/ Week	Duration	03 Hours
Tutorials:-	01 Hours/ Week	Unit Test	20 Marks
		T. W.	-- Marks

Course Prerequisites:-	Student should have knowledge of Mathematics-I
Course Outcomes:-	1. To develop an ability to solve differential equations of first order and first degree. 2. To develop an ability to form mathematical model of rectilinear motion, electric circuit, Fourier heat conduction, Newton's law of cooling. 3. To develop an ability to transform the Cartesian co-ordinates into spherical polar and cylindrical coordinate systems. 4. To develop an ability to represent periodic function as Fourier series. 5. To develop an ability to evaluate definite integral by DUIS rules and to trace Cartesian and polar curves. 6. To develop an ability to apply methods to find area and volume by double and triple integration.

Course Contents

Unit 1	**Differential Equations:**	**(09 Hrs.)**
Differential Equations of First Order and First Degree, Exact Differential Equations and Reducible to Exact form, Linear Differential Equations, Reducible to Linear types, Method of Substitution and Miscellaneous Types, Differential Equations of First and Higher degree		
Unit 2	**Applications of Differential Equations (of First Order and First Degree):**	**(08 Hrs.)**
Orthogonal Trajectories, Atmospheric Pressure, Newton's Law of Cooling, Motion Under Gravity and Rectilinear Motion, L-R, R-C and L-C Circuits, Applications to Mass-Spring System, One Dimensional Conduction of Heat Applications to Chemical Engineering.		
Unit 3	**Solid Geometry:**	**(09 Hrs.)**
Cartesian, Spherical Polar and Cylindrical Coordinate systems, Relation between coordinate systems. Sphere, Tangent Plane of the Sphere, Sphere through a Circle, Orthogonal Spheres, Cone and Cylinder, Quadratic surfaces.		
Unit 4	**Fourier Series:**	**(09 Hrs.)**
Definition and Dirichlet's Conditions, Full range Fourier series on $c \leq x \leq c + 2\prod$ and $c \leq x \leq c + 2L$, Expansions of even and odd Periodic functions and on $-\prod \leq x \leq \prod$ and $-L \leq x \leq L$, Half Range Fourier Expansions Harmonic Analysis and Application to problems in Engineering. Reduction formulae for Trigonometric functions, Beta and Gamma functions.		
Unit 5	**Foundations:**	**(08 Hrs.)**
Integral Calculus (Single Integral):		

Differentiation Under the Sign of Integration, Error functions. **Curve Tracing:** Tracing of Cartesian, Polar and Parametric curves, Rectification of curves.		
Unit 6	**Multiple Integrals and their Application:**	**(09 Hrs.)**
Double and Triple Integrations, Application of Multiple Integral to Areas and Volumes, Mean and RMS Values, Mass, Centre of Gravity and Moment of Inertia.		

Text Books / References

1. Advanced Engineering Mathematics, 5th Edition, by Peter V. O'Neil (Thomson Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
3. Advanced Engineering Mathematics by Wylie C.R. and Barrett L. C. (McGraw-Hill.
4. Advanced Engineering Mathematics, 2nd Edition, by M. D. Greenberg (Pearson Education).
5. Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
6. Applied Mathematics (Volume I & II) by P. N. Wartikar and J. N. Wartikar (Pune Vidyarthi Griha Prakashan).
7. A Text Book of Engineering Mathematics - II by P. N. Wartikar and J. N. Wartikar.

Unit Tests-

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI

ENGINEERING SCIENCE – II
(Course No. K70109)

Designation of Course	**Engineering Science – II**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Hours
Tutorials:- -- Hours/ Week	Unit Test	20 Marks
	T. W.	25 Marks

Course Prerequisites:-	Students should have knowledge of Engineering Science-I
Course Outcomes:-	1. To use the properties of charged particles to develop modern instruments and explain the mechanism of fusion and fission. 2. To understand the behavior of quantum particles in different types of potentials. 3. To understand the basics of semiconductors and its uses to develop devices such as diode, transistor, solar cell etc. 4. Students will be able to understand the fundamental principles of corrosion and methods used for minimizing corrosion. 5. To recognize the preparation, properties and applications of polymeric materials.

Course Contents

PHYSICS		
Unit 1	**Modern Physics:**	**(09 Hrs.)**
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magneto static focusing, Wavelength and resolution. Specimen limitation, Depth of field and focus. Electron microscope. Positive rays, Separation of isotopes by Bainbridge mass spectrograph. Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium. Fission energy, Critical mass and size. Reproduction factor, Chain reaction and four factor formula. Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions. Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron, Microtron.		
Unit 2	**Quantum Mechanics:**	**(08 Hrs.)**
Wave nature of matter, De-Broglie waves. Wavelength of matter waves. Electron diffraction, Davisson and Germer's experiment, Heisenberg's uncertainty principle with illustrations, Schrodinger's time dependant and time independent wave equation, Physical significance of wave function. Application of Schrodinger's time independent wave equation to the problems of (1) Electron gas, (2) Step potential (3) Potential barrier, (4) Particle in a rigid box (5) Particle in a non-rigid box (Boundary condition and result).		
Unit 3	**Electrical Properties:**	**(07 Hrs.)**
Band theory of solids. Band structures of Lithium, Sodium, Beryllium, Silicon and Diamond, Classification of solids on the basis of band theory. Fermi-Dirac probability function and position of		

Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semiconductors. Band structure of p-n junction diode under forward and reverse biasing, Conductivity in semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.		
CHEMISTRY		
Unit 4	**Corrosion And Its Control:**	**(08 Hrs.)**
Definition, dry or Chemical corrosion, wet or Electrochemical corrosion, mechanism of wet or electrochemical corrosion, Galvanic Corrosion, concentration cell corrosion passivity, underground or soil corrosion, pitting corrosion, inter granular corrosion, stress corrosion, microbiological corrosion. Electrochemical and galvanic series, Factors influencing corrosion and corrosion control.		
Unit 5	**Polymers:**	**(08 Hrs.)**
Definition and Classification based on origin and thermal behavior, Polymerization reactions, Functionality, Degree of Polymerization, tactility. Types of Polymerization - Addition and condensation, Thermo- softening and Thermosetting Plastics, Polymerisation reactions, properties and uses of some polymers such as Polyethylene, Polypropylene, Polyvinyl Acetate, Polystyrene, Teflon, Melamine Formaldehyde, PMMA, SBR. Polymers in Medicine and surgery, Polymer blends and Alloys, Engineering Plastics.		
Unit 6	**Instrumental Methods of Chemical Analysis:**	**(08 Hrs.)**
Infrared Spectroscopy, Visible Spectroscopy, Ultraviolet Spectroscopy. Introduction, Principle, Instrumentation (Schematic Diagram) and Engineering Applications of the above Techniques.		

PHYSICS: Term Work Experiments:

Any five experiments from the following:

1. Determination of band gap of semi-conductor
2. Solar cell characteristics.
3. E/m by Thomson's method.
4. Uses of CRO for measurement of phase difference by Lissajous figures
5. Hall effect and Hall coefficient
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode. Photo diode. LED, Ge/Si diode)
8. Plank's constant by photodiode.

Assignments:

Any **two** of following:

1. Harmonic oscillator
2. Nuclear radiation detectors.
3. Scanning electron microscope and scanning tunneling microscope
4. Advanced opto-electronic devices

Text Books / References

1. Physics for Engineers - Srinivasan M. R., New Age International (P) Ltd.
2. Atomic Physics - Weher and Richards, Narosa Publishing House
3. Modem Physics - B. L. Thereja, S. Chand & Company Ltd.

4. Atomic Physics - J. B. Rajam, S. Chand & Company Ltd.
5. Principle of Electronics - V. K. Mehta, S. Chand & Company Ltd.
6. Electronics Principles - A. P. Molvino, McGraw Hill International Book Company Ltd.

CHEMISTRY: Experiments:

Any **five** of the following:

1. To Determine the Molecular Weight of a polymer
2. Estimation of Copper from brass sample solution Iodometrically
3. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
4. To find the Radius of Macro Molecule by Viscometer
5. To Determine Surface Tension of a liquid by Stalagmometer
6. Determination of the strength of unknown liquid by using the colorimeter

Text Books / References

1. Fundamentals of Engineering Chemistry - Theory and Practice by S. K. Singh, New International Publishers.
2. A Textbook of Engineering Chemistry by S. S. Dara, S. Chandand Company Ltd., New Delhi.
3. Instrumental Methods of Chemical Analysis by Chatwal and Anand, Himalaya Publishing House.
4. Engineering Chemistry by Jain and Jain.
5. Nace Corrosion Engineers R. B. by R. Baboian, C. G. Munger.
6. Corrosion Engineering by Mars G. Montana & Norbert D. Green.
7. Polymer Handbook Edited by Brandrup, J. Immegut, Edmund H., etc.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ENGINEERING MECHANICS
(Course No.K20110)

Designation of Course	**Engineering Mechanics**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 4 Hours/ Week	Theory	80 Marks
Practical:- 2 Hours/ Week	Duration	03 Hours
Tutorials:- - Hours/ Week	Unit Test	20 Marks
	T. W.	25 Marks

Course Prerequisites:-	Basic knowledge of physics and mathematics.
Course Outcomes:-	1. The student should able to calculate Resultant of the Force system and also apply conditions of equilibrium for different problems. 2. The student should able to calculate Centroid and moment of Inertia of areas. 3. The student should be able to calculate effect friction force. 4. The student should be able to calculate velocity, acceleration, displacement, time for bodies in motion. 5. The student should be able to use D'Alemberts principle, Work-energy principle and Impulse momentum principle. 6. The student should be able to use concept of ICR for rigid body motion.

Course Contents

Unit 1	**Force system in a plane**	**(8 Hrs.)**
Types of forces classification of a force system Resolution of forces Resultant of a force system in a Plane- Analytical and Graphical approach Moment of a force, Couple, Force and Couple system About a point. Equilibrant, Free Body Diagram, Types of Supports, Conditions of Equilibrium Equilibrium of a force system in a plane.		
Unit 2	**Force system in a Space and Moment of Inertia**	**(8 Hrs.)**
Resultant and Equilibrium of a force system in a space, moment of a force about a point and About in line. Centroid of a line element, plane areas and volume, center of gravity, Moment Of inertia.		
Unit 3	**Application of Static Equilibrium**	**(8 Hrs.)**
Analysis of perfect Trusses – Method of Joint, Method of Section and graphical Method, Analysis of Pin Jointed Frames ,Analysis of cables subjected to Concentrated Load Coefficient of Static Friction Impending motion of Blocks , Ladder and wedges, Belt friction & Band-brake system.		
Unit 4	**Kinematics of a Particle**	**(8 Hrs.)**
Kinematics of Rectilinear motion of Particles – Equations of motion , Motion Curves ,Relative motion Dependent motion. Kinematics of Curvilinear motion of practical -Equation of motion in Cartesian, Polar and Path variable co-ordinate system, motion of projectile.		
Unit 5	**Kinetics of a Particle**	**(8 Hrs.)**
Kinetics of Rectilinear Motion of Particles , Newton's Second Law of motion , D Alembert's principal , Work- Energy Principal ,Impulse-Momentum Principal, Direct Central Impact, Coefficient of Restitution,		

Spring Force. Kinetics of Curvilinear motion of Particles: D Alembert's principle, Work-Energy Principal Impulse-Momentum Principle, Oblique Central Impact		
Unit 6	**Rigid Body Motion**	**(8 Hrs.)**
Kinematics of Rigid bodies: Translation and Rotation about a fixed axis, General Plane Motion, Concept of Instantaneous center of Rotation .Kinetics of Rigid bodies: General Plane motion, D Alembert's Principle Work-Energy Principle.		

Term Work Experiments:

A) The term-work shall consist of total SIX experiments. (Minimum THREE from each section)

Section - I

1. Determination of reactions of Simple and Compound beam Study of equilibrium of concurrent force system in a space.
2. Determination of coefficient of friction for Flat Belt and Rope Verification of Law of Polygon of forces.
3. Study of Simple Lifting Machine.

Section - II

1. Study of Curvilinear motion Determination of Coefficient of Restitution.
2. Determination of gravitational acceleration using Compound Pendulum Determination of Moment of Inertia of Fly wheel.
3. Determination of Moment of Inertia of Irregular shape body using Torsional Pendulum.

B) The term-work shall also consist of minimum SIX graphical solutions of the problems on different topics. (Minimum THREE from each section)

Text Books/ Reference Books

1. Beer F.P. and Johnston E.R., "Vector Mechanics for Engineers – Vol. –I and Vol. -II
2. Timoshenko S.P. and Young D.H."Engineering" Mechanics McGraw Hill Publication.
3. Singer E. L. "Engineering Mechanics" Haper and raw Publications.
4. Meriam J.I. and Craig "Engineering Mechanics" John Wiley and Sons Publications.
5. Shames I. H. "Engineering Mechanics" Prentice Hall of India Ltd.
6. Bhavikatti S. S. and Rajashekarappa K. G. "Engineering Mechanics" New Age International Ltd
7. Mokashi V. S. "Engineering Mechanics I and II "Tata McGraw Hill Publications
8. Tayal A. K. "Engineering Mechanics" Umesh 8. Tayal A. Publications

Unit Tests-

Unit Test-I	Unit-I & IV
Unit Test-II	Unit-II & V
Unit Test-III	Unit-III & VI

ENGINEERING GRAPHICS-II
(Course No. K60111)

Designation of Course		**Engineering Graphics-II**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	03 Hours/ Week	Theory	80 Marks
Practical:-	02 Hours/ Week	Duration	04 Hours
Tutorials:-	-- Hours/ Week	Unit Test	20 Marks
		T. W.	50 Marks

Course Prerequisites:-	Knowledge of basic drawing, mathematics and geometry.
Course Outcomes:-	1. Able to understand projection of Lines and Planes 2. Able to understand projection of solids and its sections. 3. Able to understand development of different solids. 4. Able to understand intersection of surfaces of solids

Course Contents

Unit 1	**Projections of Lines and Projections of Planes.**	**(12 Hrs.)**
Projections of points. Projections of lines situated in 1st quadrant only Horizontal trace (HT) Vertical trace (VT) Applications of lines. Auxiliary inclined plane (AIP), Auxiliary vertical plane (AVP), distance between skew lines, distance of a point from a line. Projections of planes, True shape of plane, Angle between two planes, distance of a point from a plane.		
Unit 2	**Projections of Solids and Sections of Solids:**	**(12 Hrs.)**
Projections of solids such as prisms, pyramids, cylinder, cone and sphere. Projections of solids in combination. Sections of above solids by AIP and AVP True shape of section.		
Unit 3	**Development of Surfaces of Solids**	**(09 Hrs.)**
To draw the development of the lateral surfaces of cut prism, pyramid, cylinder and cone. To draw orthographic projections from the given developed surface of solid.		
Unit 4	**Intersection of Surfaces of Solids:**	**(09 Hrs.)**
To draw the lines or the curves of intersection of the surfaces of solids excluding following combination. Pyramid-pyramid, Pyramid-cone, Cone-cone, Sphere-cone, Sphere pyramid.		

Term Work

Term work shall consists of six half-imperial size or A2 size (594mm x 420mm) Sheets

1. Projections of lines
2. Projections of planes
3. Projections of solids
4. Sections of solids
5. Development of surfaces
6. Intersections of surfaces

Text Books/ Reference Books

1. M. B.Shah and B. C. Rana, "Engineering Drawing", 1st Edition, Persian Education, 2005.
2. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10th Edition, S. K. Kataria and Sons, 2005.
3. N. D. Bhatt and V. M. Panchal, "Engineering Drawing (Plane and Solid Geometry)" 42nd Edition, Charotar Publishing House, 2000.

4. Warren J. Luzadder and Jon M. Duff, "Fundamentals of Engineering Drawing", Prentice Hall of India Pvt. Ltd., l l Edition, 1995.
5. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1- Edition, 1988.\
6. P. Nageswara Rao, "Auto CAD 14 for Engineering Drawing Made Easy", Tata McGraw Hill Co. Ltd

Note:

Paper shall be based on the topics covered in the syllabus of Engineering Graphics-I and Engineering Graphics-II

Unit Test:

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ELEMENTS OF ELECTRICAL &ELECTRONIC ENGINEERING
(Course No. K40112)

Designation of Course		**Elements Of Electrical & Electronic Engineering**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	04 Hours/ Week	Theory	80 Marks
Practical:-	02 Hours/ Week	Duration	03 Hours
Tutorials:-	-- Hours/ Week	Unit Test	20 Marks
		T. W.	25 Marks

Course Prerequisites:-	Basic knowledge of physics, electronics, electrical.
Course Outcomes:-	1. Able to understand and apply knowledge of basic laws and theorems to solve simple electrical dc circuits. 2. Able to define basic terms of single phase and three phase ac circuits and supply systems. Draw vector diagram and solve simple numerical on ac circuits. 3. Able to describe fundamental concepts of magnetic and electromagnetic circuits. Explain principle of transformer and calculate efficiency and regulation of transformer 4. Able to draw power supply system layout, block diagram of SMPS, UPS. Know and use electrical safety rules. 5. Able to specify and select electronic components as per required application. 6. Able to specify and select suitable measuring instruments for required application.

Course Contents

Unit 1	**Basic Concepts in Electrical Circuits:**	**(08 Hrs.)**
Fundamental electrical quantities: Potential difference(voltage),current, power, energy, circuit elements-resistance, inductance, capacitance, laws for dc circuits analysis-Kirchhoff's voltage and current law, superposition theorem, the venin's theorem, maximum power transfer theorem.		
Unit 2	**AC Circuits:**	**(08 Hrs.)**
Graphical, mathematical and phase representation of ac voltage and currents, instantaneous, average and RMS value, peak factor form factor, periodic time, frequency, phase difference, power factor and complex power, analysis of series and parallel single phase ac circuits consisting of R,L,C combinations and Resonance phenomenon. Concept of 3-phase ac supply, supply specifications, phase sequence, star and delta connection and their line and phase values, current, voltage and power relationship for balanced 3-phase star and delta connected loads(with phase representation)		
Unit 3	**Magnetic circuits and Transformer**	**(08 Hrs.)**
Magnetic effects of an electric current ,magnetic circuit concepts terms MMF, flux density, field intensity, permeability, reluctance, composite series and parallel magnetic circuits, magnetization and hysteresis curve hysteresis and eddy current loss. Introduction to 1-phase transformer, function, principle of operation, types ,specifications, EMF equations ideal and practical transformer ,operation on no load and load conditions, losses, efficiency, regulation, determination of efficiency and regulation by direct loading introduction to auto transformation and instrument transformers.		
Unit 4	**Electrical power Systems:**	**(08 Hrs.)**

Generation, transmission and distribution systems layout ,types of supply system 3 phase-3wire,3phase-4 wire ac system rectifiers half wave, full wave, bridge wave with relevant wave forms, UPS, SMPS, stabilizers. Electrical safety, Necessity of earthing-safety and first aid measures against electrical shock.		
Unit 5	**Electrical and Electronic component, device and Integrated Circuits:**	**(08 Hrs.)**
Basic principle and applications of D.C. machines, connection diagram, load characteristics and applications, three phase induction and working principle. Types of resistance (fixed, variable, precision-carbon film, metal film, wire wound) their standard values specifications and applications .classification of capacitors based on dielectrics ,their standard values, specification and applications, study of different core materials depending on range of frequencies for inductors and transformers. Flat package, SMD's, pin configuration and cooling of LC's mounting of LC's basic block diagram and its explanation along with specifications of Mobile phones fax machines, Microwaves , personal computers.		
Unit 6	**Electrical and Electronic Instruments:**	**(08 Hrs.)**
Salient constructional features, operating principle, specification of PMMC and MI voltmeter and ammeter, Dynamometer- wattmeter, Induction type single phase energy meter. Basic block diagram, its explanation, specification and application of Digital millimeter, Function generator, CRO.		

List of Practical's to be performed in the laboratory

1. Verification of Kirchhoff's current and voltage laws for D. C. network Verification of superposition theorem for a given D. C. network.
2. Experimental verification of current flowing through a branch of D. C. circuit using the venin's theorem.
3. Verification of maximum power transfer theorem for D. C. circuit Performance of 1-phase a. c. R-L-C circuit and developing phase or diagram Verification of relationship between star and delta connection (balanced).
4. Efficiency and regulation of a given 1-phase transformer by direct loading Testing and operation of domestic appliances.
5. Use of CRO for obtaining wave forms of electrical quantities Load characteristics of different rectifiers.

Text Books/ Reference Books

1. Electrical Technology- Edward Huges

2. Basic Electrical Engineering D. P. Kothari, Nagrath

3. Electrical power system technology-S.W. Fordo, D. R. Patrick

4. Principles of Electronics-Dr. H. M. Rai

5. Electronic Devices and circuit Theory- R. L. Boylestad and L. Nashelsky

6. Electrical, Electronics Measurements and Instrument

7. Principles of Communication Engineering- Anokh Singh, A. K. Chhabra

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V,VI

COMPUTER FUNDAMENTALS AND INFORMATION TECHNOLOGY
(Course No. K70113)

Designation of Course	**Computer Fundamentals And Information Technology**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- ---Hours/ Week	**Theory**	-- Marks
Practical:- 02 Hours/ Week	**Duration**	--Hours
Tutorials:- -- Hours/ Week	**Unit Test**	-- Marks
	T.W.	25 Marks

Course Prerequisites:-	Basic Computer software knowledge and computer accessories.
Course Outcomes:-	1. Able to study different types of Number Systems and Conversion Techniques. 2. Able to understand the working of different types of Input/ Output Devices 3. Able to learn Software installations on Various Platforms 4. Able to develop familiarity with MS Office Suite. 5. Able to understand the Characteristics of Object Oriented Programming. 6. Able to write simple programs in C++.

Course Contents

Unit 1	**Computer Fundamentals**	
Computer basics, data representation, number system. Computer architecture, Microcomputer PC hardware: CPU, Memory, Disks, Cards, Slots, Floppy And Modem.		
Unit 2	**Input / Output / Storage Devices**	
Input devices: function, typical examples of input devices with their installation such As keyword, mouse, scanners, bar code readers, MICR readers, Audio and Video input Devices. Output devices: Typical examples of output devices with their installation such as VDU, printers, TFT, Audio and Video output devices. Storage devices: Primary storage such as RAM, ROM, secondary storage such as floppy disk, hard disk, CD ROM, ZIP drives tape drives, DAT etc.		
Unit 3	**Software**	
Software characteristics, Types of software's files, Introduction to OS with DOS Commands. Operating environment such as windows. Programming language with High level and low-level programming. Utility packages such as MS office with MS- Word, Power Point, Excel, CAD and their typical applications in engineering.		
Unit 4	**MS-Windows**	
Introduction, Installation, Utilization, Features, and Accessories-notepad, paint, and word pad. Communication, Entertainment, System tools: disk cleaning, scan disk, Formatting disk, disk defragmentation etc. System setting. Control panel, desktop. Internet: Modem Types, Connectivity, TCP/IP, ISP, ISDN, Getting connected, and WWW. Browsers such as IE-5, Email, Newsgroups, Chatting, and Internet security. Search engines such as yahoo, Google, info seek, Alta Vista, hot boat etc. Computer Network, Basic concept. Layers, Topologies, Introduction to Networking. Types of LAN, WAN, MAN, Internet working. Wireless networks, Satellite links		

Unit 5	Database Management Systems (DBMS)	
File concepts. Database, logical and physical databases. Data modeling: hierarchical, Network, relational, and object oriented. Concept of normalization: database creation And modification using SQL. Sample queries. Multi Media System: Introduction to Multimedia System, Multimedia components, Text, audio, video, etc.		
Unit 6	**Latest trends in Information Technology**	
Study of MIS, BIS, GIS, OOP Concepts: Comparison of structured and object oriented Programming language, object structures. Object classes. Inheritance, Object identity. Encapsulation, Polymorphism.		

Term Work:

Term work will consist of ten assignments based on above syllabus out of which four assignments will be based on C programming language.

Assignment List:

1. Study of various Input and Output devices like Keyboard, Mouse, Scanner, Monitor, Printer etc.
2. Software Installation: Install any Office suite for study purpose
3. Study of any Office suite: Features make new documents, save documents, edit documents.
4. Study of various data representation & conversion techniques (Decimal to Octal, Decimal to binary, Decimal to hexadecimal)
5. Study of an operating system and list its features like I/O processing, memory management, process management.
6. Study basic of basic UNIX OS Commands (directory, file maintenance commands)
7. Compare the basic features of Windows OS with Linux or UNIX OS? Design a Spreadsheet for a given application
8. Study of Search Engines (like Google, Yahoo, AltaVista, Info Seek) and its features & WWW technologies.
9. Design a 3-D structure using any design tool
10. List and study database driven software.
11. Create a Database in any suitable application and perform add, delete and modify operations on it
12. Write a C++ program to compare 3 integer and display the greatest number
13. Write a C++ program to perform arithmetic operations on two complex numbers using operator overloading
14. Write a C++ program to study the concept of Inheritance

Required Software for above assignments:

1. UNIX / Linux
2. MS Windows
3. Open Office / MS Office / Star Office
4. 3D Studio MAX /Maya
5. Turbo C++

Text Book/References

1. Dr. V Rajaraman: Computer Fundamentals
2. Peter Norton: Inside IBM PC, (TMH)
3. Tannanbaum: Computer Networks, (TMH)

4. Korth: Database Management Systems, (TMH)
5. Yashwant Kanitkar: C-Programming
6. C Programming Language : Reference and Users Manuals, Microsoft Press
7. Steven Alter: Information Systems, Addison Wesley
8. Stroutstrup: Programming in C, (TMH)

WORKSHOP PRACTICE-II
(Course No: K60114)

Designation of Course	**Workshop Practice-II**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- -- Hours/ Week	Theory	-- Marks
Practical:- 02 Hours/ Week	Duration	-- Hours
Tutorials:- -- Hours/ Week	Unit Test	-- Marks
	T. W.	50 Marks

Course Prerequisites:-	Basic knowledge of fabrication techniques, machine components.
Course Outcomes:-	1. The student should know the different sections of metal and wood working processes. 2. The student should able to handle the marking, measuring and cutting tools used in fitting section. 3. The student should able to get the practical Knowledge of sheet metal work. 4. The student should able to handle the different tools used in black smithy. 5. The student should able to get the Practical Knowledge of plastic molding process. 6. The student should able to get the Practical Knowledge of Plumbing process.

Course Contents

Students are required to complete the remaining set as the Term Work of Workshop Practice - II

Set A shall consist of

Jobs:

1) Woodworking-one job involving joint, woodtuming, use of filler materials and adhesives
2) Welding- one job with edge preparation and simple joint using gas or arc welding.
3) Soldering- Fabrication of at least 5 electronic components on a PCB.
4) Demonstration on a centre lathe and CNC lathe.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions.

Set B shall consist of

Jobs:

1) Fitting- one job with one joint along with drilling, tapping, hacksaw cutting
2) Tin smithy- One job including riveting/ soldering
3) Black Smithy- One job with at least two different operations
4) Plastic moulding- one plastic component on injection moulding machine.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions

At the end of each semester students are required to submit the completed jobs and journal for assessment of work done in workshop

Department of Mechanical Engineering

ENGINEERING MATHEMATICS-III
(Course No. K70208)

Designation of Course		**Engineering Mathematics-III**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	04 Hours/ Week	Theory	80 Marks
Practical:-	-- Hours/ Week	Duration	03 Hours
Tutorials:-	01 Hours/ Week	Unit Test	20 Marks
		T. W. & Or.	----

Course Prerequisites:-	Student should have knowledge of differential equations, Fourier Series.
Course Outcomes:-	1. Able to develop an ability of mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient. 2. Able to develop an ability to solve the Laplace, heat and wave equations for a variety of boundary conditions in domains of simple geometry and with simple boundary conditions; the techniques available will include, separation of variables. 3. Able to develop an ability to use theorems to compute the Laplace transform, inverse Laplace transforms. 4. Able to develop an ability to understand basics of statistics and probability. 5. Able to develop an ability to calculate the gradients and directional derivatives of functions of several variables 6. Able to develop an ability to use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Course Contents

Unit 1	**Differential equations:**	**(09 Hrs.)**
Solution of Linear differential equation of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's (Homogeneous type) and Legendre's linear equations. Simultaneous linear differential equations, Total differential equation, Symmetrical Simultaneous differential equations.		
Unit 2	**Applications of differential equations:**	**(08 Hrs.)**
Application to mass spring systems with coupled masses, equivalent electrical circuits. Solution of multi degree of freedom systems (Vertical and Horizontal). By matrix method, Natural frequencies and normal modes of vibration. Applications of Partial differential equations: Solution of wave equation, one and two-dimensional heat flow equation by method of separating variables. Application to mechanical and allied engineering problems.		
Unit 3	**Transforms:**	**(09 Hrs.)**
Fourier transforms: Fourier integral theorem, Fourier sine and cosine integrals, Fourier Transform,		

Fourier sine and cosine transforms, Inverse Fourier transforms, Solution of boundary value problems using Fourier transform (Diffusion equation only). La place Transform: Definition, Properties and Theorems, Inverse Laplace transform, Methods of finding inverse Laplace transform, Application to solution of linear differential equations.		
Unit 4	**Statistics and Probability:**	**(09 Hrs.)**
Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Probability density function and probability mass function, Binomial, Poisson's, Normal and Hyper geometric distributions, Test of Hypothesis: Chi-Square test of goodness of fit and Independence of attributes, Introduction to Decision and Quality control.		
Unit 5	**Vector Differentiation:**	**(09 Hrs.)**
Radial, Transverse, Tangential, Normal components of linear velocity and acceleration, Gradient, Divergence and Curl, Directional derivative, vector identities Irrotational and Solenoidal Vector fields.		
Unit 6	**Vector Integration:**	**(08 Hrs.)**
Line integral, Surface integral and Volume integral, Work done, Gauss- Divergence theorem, Stoke's theorem and Greens lemma. Applications to fluid flow, Streamline's, Continuity equation, Motion equation and Bernoulli's equation.		

Text Books/ Reference Books

1. Wylie C. R. and Barrett L. C. Advanced Engineering Mathematics, McGraw-Hill.
2. M. D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi.
4. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volume I & II), Vidyarthi Griha Prakashan.
5. Irwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice-Hall of India.
6. Peter V. O'Neil, Advanced Engineering Mathematics, 5th Edition, Thomson learning Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

INTERNAL COMBUSTION ENGINES
(Course No.K60204)

Designation of Course		**Internal Combustion Engines**	
Teaching Scheme:		**Examination Scheme:**	
Theory:-	04 Hours/ Week	Theory	80 Marks
Practical:-	02 Hours/ Week	Duration	03 Hours
Tutorials:-	-- Hours/ Week	Unit Test	20 Marks
		T. W. & Pr.	50 Marks

Course Prerequisites:-	1. Basic information of thermodynamics. 2. Basic knowledge of fluid mechanics.
Course Outcomes:-	1. Identifying different components of IC engines 2. Able to calculate efficiency of different air standard cycles 3. Able to understand working principles of carburettors, fuel injection systems, fuel pumps 4. Determination of power, fuel consumption, efficiency of the engine 5. Understand detonation and knocking processes 6. PUC norms Bharat I-IV and Euro I-IV

Course Contents

Unit 1	**Constructional Features of Reciprocating I. C. Engine:** *And **Cycle Analysis of I. C. Engines:***	**(08 Hrs.)**
Engine components and Engine classification. Fuel air cycle analysis .Comparison of P-V diagram of air standard cycles Fuel air cycle & actual cycle.		
Unit 2	**Fuel Supply Systems:**	**(08 Hrs.)**
S.I. Engines: Carburetion, Mixture requirements, Essential parts of modern carburetor, Carburetors used on automobiles, Calculation of A/F ratio, M.P.F.I. system for modern automobile engines. C.I. Engines: Functional requirements of an injection system, Typical arrangement of solid injection system, Types of fuel injection system, Fuel pump & fuel injectors, Quantity of fuel & size of nozzle orifice.		
Unit 3	**Ignition System:**	**(08 Hrs.)**
Battery & coil ignition system Magneto ignition system Electronic ignition system Advantage over mechanical contact breaker point system Engine Cooling System: Air cooling, Water cooling, Thermostatic radiators Lubrication System: Dry sump lubrication Wet sump lubrication – Fully pressurized, Oil filters Governing System: Quality governing Quantity governing, Hit & miss governing		
Unit 4	**Testing & Performance of I. C. Engine** ***And Supercharging:***	**(08 Hrs.)**
Determination of brake power, Indicated power, Friction power, Determination of brake thermal efficiency, Mechanical efficiency, Volumetric efficiency, Energy balance, Performance characteristics. Objects of supercharging, Effects on performance, Limits, Methods of supercharging & turbo charging, Limitation of turbo charging.		

Unit 5	**Combustion in S. I. Engines** *And* ***Combustion in C. I. Engines:***	**(08 Hrs.)**
Stages of combustion, Effect of engine variables on ignition lag & flame propagation, Abnormal combustion: Theories, Effects & Controlling measures, Combustion chambers for S. I. engines. Stages of combustion, Ignition delay & factors influencing delay period, Diesel knock & its control, Combustion chambers for C. I. engines.		
Unit 6	**Emissions & Pollution Control And Fuels:**	**(08 Hrs.)**
Emissions from S. I. and C. I. engines & their harmful effects, Catalytic convertors, Contemporary & proposed emission norms, BHARAT I to IV emission norms. Types of fuels for I. C. engines, Rating of S. I. & C. I. engine fuels, Alternative fuels for I. C. engines & future trends, Hybrid vehicles.		

Term Work

1. A journal containing record of any eight experiments of the following: Study of carburetor / MPFI system
2. Study of fuel pump & injector.
3. Trial on multi cylinder petrol engine – Morse Test.
4. Trial on diesel engine to determine energy balance & variable load performance. Variable speed trial on petrol / diesel engine.
5. Trial on computerized I. C. engine to plot P – θ diagram.
6. Trial / demonstration of smoke meter & exhaust gas analyzer. Study of battery, magneto & electronic ignition system.
7. Study of superchargers & turbochargers.
8. Study of combustion chambers in S. I. & C. I. engines.

Text Books/ Reference Books

1. Ganeshan V., Internal Combustion Engines, Tata McGraw Hill Publishing House
2. L. Mathur & R. P. Sharma, A Course in I. C. Engines, Dhanpat Rai & Sons
3. V. M. Domkundwar, A Course in I. C. Engines, Dhanpat Rai & Co.
4. I. C. Engines, R. K. Rajput, Laxmi Publications (P) Ltd. – New Delhi
5. Shrinivasan, Automobile Engines, Tata McGraw Hill Publishing House – CBS Publication

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

THEORY OF MACHINES- I
(Course No: K60205)

Designation of Course	**Theory of Machines- I**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	**Theory**	80 Marks
Practical:- 02 Hours/ Week	**Duration**	04 Hours
Tutorials:- -- Hours/ Week	**Unit Test**	20 Marks
	T. W. & Or.	50 Marks

Course Prerequisites:-	1. Engineering Mathematics 2. Engineering Mechanics
Course Outcomes:-	1. Understand various concepts related to mechanisms of machines 2. Use mechanism for appropriate application 3. Draw velocity, acceleration, inertia force polygons 4. Calculate velocity, acceleration of mechanism elements 5. Calculate forces on different parts of engine 6. Understand synthesis of mechanisms

Course Contents

Unit 1	**Basic Concept and Definition**	**(06 Hrs.)**
Link – Binary, ternary, quaternary, Structure, Machine, Mechanism, Kinematic pair – Classification, Kinematic Chain and Mechanism – Grubler's criteria for movability of chains and mechanism as locked constrained, Unconstrained based on grubler's criteria, Inversion of single slider and double slider crank chain, Inversion of four bar chain.		
Unit 2	**Mechanism with lower Pair**	**(06 Hrs.)**
Study of Pentograph, Study of exact straight line motion mechanism, Study of approximate straight line motion mechanism, Steering Gear Mechanisms, Hook's or Universal joint, Ratchets and Escapement Mechanism, Swinging / Rocking Mechanism, Indexing Mechanism.		
Unit 3	**Velocity and Acceleration Analysis**	**(12 Hrs.)**
Instantaneous centre method to determine velocities, Methods of locating Instantaneous center, Kennedy's theorem of three centers, Body and space Centroides. Relative velocity and Relative acceleration Method, Coriolis component of acceleration. Klien'sconstruction.		
Unit 4	**Analytical Method**	**(06 Hrs.)**
Velocity and Acceleration by Vector Algebra, Complex Algebra and Analytical method.		
Unit 5	**Static and Dynamic Force Analysis**	**(10 Hrs.)**
D'Alemberts Principle, Radius of gyration of rigid bodies, Theory of compound pendulum, Bifillar & Trifillar Suspension, Dynamically equivalent system, correction couple Inertia in I.C. Engine Mechanism by analytical and graphical Method, Inertia of Geared system.		
Unit 6	**Introduction to Analysis and Synthesis of Mechanism**	**(08 Hrs.)**
Type, Number and Dimensional Synthesis, Function Generation, Path Generation and Body Guidance, Two position synthesis of slider crank mechanism, Two position synthesis of crank and rocker mechanism, Crank rocker mechanism with optimum transmission angle, Three position synthesis, Frudenstein method.		

Term Work

1. Determination of Moment of inertia by Bifilar / Trifillar Suspension Method.
2. Compound Pendulum.
3. Experimental verification of displacement relation of different shaft angle for single Hooke's joint
4. Assignment
5. Developing a computer program for velocity and acceleration analysis of slider crank mechanism / Four bar mechanism.
6. Study of steering gear mechanism.
7. Drawing sheets
8. Velocity by Instantaneous Centre Method
9. Relative Velocity and Relative Acceleration Method
10. Coriolis component of acceleration.
11. Straight line Motion Mechanism.
12. Inertia force analysis using graphical method

Text Books/ Reference Books

1. Thomas Bevan, Theory of Machine, CBS Publication
2. J. E. Shingley, Theory of Machine, McGraw Hill
3. John Hannah and R. C. Stephens, Mechanics and Machines, Advanced theory and examples, Edward Arnold
4. R. S. Khurmi and J. K. Gupta, Theory of Machines, Eurasia Publishing House
5. S.S. Rattan, Theory of Machines, McGraw Hill
6. Abdulla Shariff, Theory of Machine, Dhanpat Rai Publication
7. P. L. Ballney, Theory of Machines, Khanna Publications

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

MATERIAL SCIENCE AND ENGINEERING METALLURGY

(Course No: K60243)

Designation of Course	**Material Science and Engineering Metallurgy**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Hours
Tutorials:- - Hours/ Week	Unit Test	20 Marks
	T.W. & Or.	50 Marks

Course Prerequisites:-	1. Engineering Physics 2. Engineering Chemistry
Course Outcomes:-	1. Able to do selections of metals and non-metals as per mechanical properties, density, ductile and brittle. 2. Able to do Mechanical testing, Nondestructive as per standard methods. 3. Able to do Plotting of Equilibrium diagram and use it in manufacturing for producing different types of alloys. 4. Able to do working in Steel Manufacturing industry as well as processing industry. 5. Able to do work in ceramics and composite manufacturing industry. 6. Able to do apply knowledge of Nonferrous metals in actual industrial and society problems related to corrosion

Course Contents

Unit 1	**Crystal Structure of Metals and Plastic Deformation**	**(08 Hrs.)**
Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Deformation of single crystal, Polycrystalline metals, Critical resolve shear stress, Work Hardening, Cold and hot working, Annealing and re - crystallization.		
Unit 2	**Mechanical Testing of Metals:**	**(08 Hrs.)**
Study of destructive testing, Tensile test , Engineering stress and true stress strain, Numerical based on Evolution of properties, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non Destructive testing such as Liquid dye penetrate test, Magna flux test, Eddy current test, Ultrasonic testing and Radiography testing.		
Unit 3	**Study of Equilibrium Diagrams:**	**(08 Hrs.)**
Relatedtermsandtheirdefinitions,HumeRuther'sruleofsolidsolubility,Allotropyandpolymorphism,Solidification,Dendriticgrowth,Coolingcurves,PlottingofEquilibriumdiagrams,Leverrule,Coring,Eutecticsystem,Partialeutecticandeutectoidsystem,NonEquilibriumcoolingandit'seffects.		
Unit 4	**Study of Steel and Cast Irons:**	**(08 Hrs.)**
Production of steel and cast Irons, Allotropy of Iron, Iron and Iron Carbide Equilibrium Diagram, Classification of Steels, Specifications of steels, Plain Carbon steel, Applications and microstructure of steels, Study of cast iron, Classification and applications of cast irons, Properties and manufacturing methods, Effect of alloying elements Alloy cast irons etc.		

Unit 5	Study of Non-Ferrous Materials:	(08 Hrs.)
Introduction, Copper and it's alloy, Alpha and alpha beta brasses, Zinc Equivalent , Copper Nickel alloy, Bronzes, Aluminum and it's alloy, Precipitation and age hardening ,Dispersion strengthening , Nickel and it's alloy, Metals at High and Low Temperature, Bearing Materials etc.		
Unit 6	**Study of Composite Materials and Ceramics:**	**(08 Hrs.)**
Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field. Ceramic, Properties and applications of ceramics. Manufacturing of ceramics.		

Term Work

List of Experiments :(AnyEight)

1. Tensile test to determine strength and other mechanical properties
2. Hardness test Brinell and Vickers
3. Rocwell and Poldi hardness test
4. Study of Microstructure of plane carbon steel
5. Study of Microstructure of cast irons
6. Magnetic Particle test
7. Liquid Penetrate test
8. Ultrasonic Test
9. Visual inspection of casting and welded components

Text Books/ Reference Books

1. Dr. V. D Kodgere , Material Science and Physical Metallurgy, Everest Publication,
2. Pune S H Avner, Physical Metallurgy, McGraw Hill Publication
3. O. P. Khanna, Material science and metallurgy, Khanna Publication, Delhi
4. R K. Rajput, Material Science and Engineering, S K Kataria and Sons Publication, Delhi

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

COMPUTER AIDED DRAFTING AND MACHINE DRAWING
(Course No: K60206)

Designation of Course	**Computer Aided Drafting And Machine Drawing**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical: 02 Hours/ Week	Duration	04 Hours
Drawing:- 02 Hours/ Week	Unit Test	20 Marks
	T.W. & Pr.	50 Marks

Course Prerequisites:-	Student should have knowledge of engineering graphics and fundamentals of computer.
Course Outcomes:-	1. Able to design simple components with tolerances 2. Able to understand different types of joints used in engineering practices 3. Able to interpret the assembly drawing and draw components drawing. 4. Able to use CAD Software. 5. Able to understand 3D drawings and surface modelling 6. Able to understand basic concepts in AUTOLISP

Course Contents

Unit 1	**Dimensioning Practices:**	**(04 Hrs.)**
Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares. Conventional Representation of Machine Components As per SP-46 (1988), ISO Systems of Tolerancing, Tolerance and Allowances, Unilateral and Bilateral limits. Maximum Material Condition (MMC), Methods of tolerance, Indications of deviations and limits of sizes, Tolerances for linear and Angular dimensions, Types of fits with symbols and applications, Types of nut locking arrangements, Threaded hole and stud assembly. Set screws: Grub screws, Geometric Tolerancing, General definitions, Symbols, Interpretations, Conventional representation on part drawing Surface Roughness: Surface feature, Machining symbols, Roughness value (Ra) Roughness grade numbers, Conventional representation on part Drawing, Manufacturing process and Surface finish.		
Unit 2	**Types of joints:**	**(04 Hrs.)**
Thread forms and their properties, Standard Tables of ISO Metric Threads, Thread designation, Single and multi start threads, Right and left hand threads, Types screws, bolt and nuts, Types of nut locking Arrangements, Threaded hole and stud assembly, Set screws, Grubs screws, Screwed Joints Welded Joints, Types of pipes and pipe joints, Flange joint Spigot and socket joints , Cotter joint, Hydraulic pipe joints Screwed and flanged union , Expansion joints, Stuffing box and Gland, Piping Layouts, Conventional representation of pipe fitting		
Unit 3	**Assembly and Part Drawing:**	**(08 Hrs.)**
Production Drawing, Bill of Materials Assembly and Part Drawings, Such as: Boiler mounting, Steam engines, Machine tools, Automobile Parts		
Unit 4	**Introduction to Computer Aided Drafting:**	**(06 Hrs.)**

Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in Auto CAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer		
Unit 5	**3-D Drawing, Surface Modeling:**	**(10 Hrs.)**
WCS, View Point, and UCS, Working with UCS, Orthographic Views Surface Modeling: Box, Wedge, Pyramid, Cone, Sphere, Dome, Dish Introduction to Solid Modeling: Box, Wedge, Cylinder, Cone, Sphere, Extrude, Revolved, Slice section, Union, Subtract.		
Unit 6	**Introduction to AUTOLISP:**	**(08 Hrs.)**
Concepts of Parametric Programming Data Types AUTO LISP, Integers, Real Numbers, Strings, Symbols Lists, Selection Sets, Data Types Conversion: Integer to Real, String List, Real to Integer, AUTO LISP Math Functions: Addition, Subtraction, Multiplication, Division Maximum and Minimum of Numbers, Reminder and Exponential Operating Functions. Get Functions for user input, Working with Lists and Entities, and Filtering from Lists, Editing Lists and Entities Introduction to Decision. Making and Looping in AUTO LISP.		

Term Work

1. Firstsheetbasedondimensioningpractice,conventionandsymbolsinmachine drawing
2. TwoDrawingAssignmentsbasedonAssemblyandDetailsofMachineParts,Automobile parts, Engine, Boiler parts etc. (One Drawing assignment preferably on Auto CAD)
3. Four Auto CAD drawing assignments
4. Four Auto Lisp Programming assignments

T.W. & Oral

Term work and oral will be based on above syllabus

Practical Assignment Schemes

1. Signals And Systems
2. Concerned staff member is directed to frame two assignments on each Unit

Text Books/ Reference Books

1. SP46:1988,EngineeringDrawingPracticeforSchoolandColleges
2. George Omura, The ABC's of AutoLisp, BPB Publications,1990, New Delhi
3. Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, PHI Pvt. Ltd., 11th edition, 1995, New Delhi
4. K. L. Narayana, P. Kannaiah and K. Venkata Reddy, Machine Drawing, New Age Int. (P) Ltd., 2nd edition, 1999, New Delhi
5. N. D. Bhattand V. M. Panchal, Machine Drawing, Charotar Publishing House, 33rd edition, 2000, Anand
6. R. B. Gupta, Machine Drawing, SatyaPrakashan,7th edition,2000, New Delhi
7. P. S. Gill, Machine Drawing,S. K. Kataria & Sons,17th edition,2004, Delhi
8. N. Sidheswar, P. Kannaiah and V. V. S. Sastry, Machine Drawing, Tata McGraw Hill, 28th reprint, 2004, Delhi
9. M. D. Junnarkar, Machine Drawing, Pearson Education (Singapore) Pvt. Ltd., 1st edition, 2005, Delhi

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

WORKSHOP PRACTICE IV
(Course No.K60244)

Designation of Course	**Workshop Practice IV**	
Teaching Scheme:	**Examination Scheme:**	
Theory:- -- Hours/ Week	Theory	-- Marks
Practical:- 02 Hours/ Week	Duration	-- Hours
Tutorials:- -- Hours/ Week	Unit Test	-- Marks
	T. W. & Or.	50 Marks

Course Prerequisites:-	Students should have knowledge of welding, maching, drilling and manufacturing techniques.
Course Outcomes:-	1. Able to perform different operations on lathe and drilling machines 2. Able to perform different operations on milling machine 3. Able to perform different operations on grinding machine 4. Able to get knowledge of NC/CNC machines.

Course Contents

Content:

Each candidate shall be required to complete and submit the following term work.

Part - A:

One composite job consisting of machining of components covering operations on: Lathe, Shaping Drilling, Milling, Grinding Machines. Composite job should consist of 3 to 4 components and covering 5 to 6 different machining operations including one precision turning operation.

Part - B:

Demonstration on NC/CNC machine or trainer for manufacturing of simple components.

Journal:

A journal will have assignments of M/C tools. This should include sketches and description as given below – (Any Five)

1. Moulding and core testing (clay content test, moisture content test)
2. Fluidity test using fluidity spiral.
3. Green strength of mould and green strength of core.
4. At least one assignment on casting process.
5. Demonstrations of Grinding machine
6. Assignment on Grinding Machine
7. Demonstration and assignment on non-conventional machining process.

Practical Examination:

A practical examination of Six hours based on term work shall be conducted at the end of semester.

Rules regarding ATKT, Continuous Assessment and award of Class

A. T. K. T.

- A candidate who is granted term for B. Tech. Semester-I will be allowed to keep term for his/her B. Tech. Semester-II examination even if he/she appears and fails or does not appear at B. Tech. Semester-I examination.
- A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B. Tech. Semester-IV examination even if he/she appears and fails or does not appear at B. Tech. Semester-III examination.
- A candidate who is granted term for B. Tech. Semester-V will be allowed to keep term for his/her B. Tech. Semester-VI examination if he/she appear and fails or does not appear at B. Tech. Semester-V examination.
- A candidate who is granted term for B. Tech. Semester-VII will be allowed to keep term for his/her B. Tech. Semester-VIII examination if he/she appears and fails or does not appear at B. Tech. Semester-VII examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B. Tech. Semester-I & II taken together.
- A candidate shall be allowed to keep term for the B. Tech. Semester-V of respective course if he/she has no backlog of B. Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-VII course if he/she has no backlog of B. Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

- In respect of Term work at B. Tech. Semester-I & II, B. Tech. Semester-III & IV and B. Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment

or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

- Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.
- For B. Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

- Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or more marks but less	First Class
C	Aggregate 55% or more marks but less	Higher Second Class
D	Aggregate 50% or more marks but less	Second Class
E	Aggregate 40% or more marks but less	Pass Class