### University of Pune

**Faculty of Engineering**

**F.E. (Common to All Branches) 2008 Structure (w.e.f. June-2008)**

#### PART – I

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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</thead>
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<td>Lect. Tut. Pract./Drg. Paper TW Oral Pr Total</td>
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#### PART – II

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<td>150 - - 650</td>
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* Communication Skill : Practical will be conducted by respective departments,. hence no subject code is allotted..

** This change has been done in the Meeting of Dean & Chairman of Faculty of Engineering held on dt. 23-5-2008.
UNIVERSITY OF PUNE
Syllabus for Engineering Degree Course – Revision 2008

Teaching Scheme:            Examination Scheme:
Lectures – 4 Hrs./Week               Paper – 100 Marks(3 Hrs. Duration)

Unit 1 (09 Hrs.)
Matrices: Rank, Normal form, System of Linear Equations, Linear Dependence and Independence,
Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem.
Application to problems in Engineering (Translation and Rotation of Matrix).

Unit 2 (09 Hrs.)
Complex Numbers & Applications: Argand’s Diagram, De'Moivre's theorem and its application to find
roots of algebraic equations. Hyperbolic Functions, Inverse Hyperbolic Functions, Logarithm of
Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

Unit 3 (09 Hrs.)
Infinite Series: Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute
and Conditional Convergence, Range of Convergence.
Differential Calculus: Successive Differentiation, Leibnitz Theorem.

Unit 4 (09 Hrs.)
Expansion of Functions: Taylor's Series and Maclaurin's Series.
Differential Calculus: Indeterminate Forms, L’ Hospital's Rule, Evaluation of Limits.

Unit 5 (09 Hrs.)
Partial Differentiation and Applications: Partial Derivatives, Euler's Theorem on Homogeneous
Functions, Implicit functions, Total Derivatives, Change of Independent Variables.

Unit 6 (09 Hrs.)
Jacobian: Jacobians and their applications. Errors and Approximations.
Maxima and Minima: Maxima and Minima of Functions of two variables, Lagrange's method of
undetermined multipliers.

Text Books:
Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:
Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar
(Pune Vidyarthi Griha Prakashan, Pune).
UNIVERSITY OF PUNE
Syllabus for Engineering Degree Course-Revision 2008
F.E. Semester – I : 107002 – Applied Science – I

Teaching scheme:
Lectures – 4 Hrs./Week
Practicals – 2 Hrs./Week

Examination scheme:
Paper – 100 Marks (3 Hrs)
T.W. 25 Marks

Both schemes are exactly half for Chemistry and Physics each

Chemistry

Unit 1: Solid state and materials chemistry (08 Hrs.)
Crystallography:- Unit cell, Bravais lattices, Cubic crystals - CN, APF, radius ratio. Three laws of crystallography, Weiss indices and Miller indices with numericals, X-ray diffraction – Bragg’s Law and numericals. Crystal defects (point and line defects) and their effects on properties of crystals. Zinc sulphide – structure and applications as luminescent.

Molecular electronics:- Basic concepts. Study of following molecules for their structures and properties on the basis of orbitals, chemical bonding, band theory, electrical conductivity, applications in electronics such as in diodes, transistors, ICs, photovoltaic devices, sensors etc.
1. Conductive polymers-polypyrrole, polythiophene
2. Pure carbon compounds- graphite, single wall and chiral carbon nano-tubes, fullerenes
3. Liquid crystals
4. Charge transfer compounds-tetrathiofulvalene.

Unit 2: Volumetric analysis (08 Hrs.)
Standard solutions and their preparations, various ways of expressing concentrations of solutions, equivalent weights in different types of reactions. Volumetric analysis – acid-base, complexometric, oxidation-reduction, precipitation – with specific examples, theories of indicators used in above titrations, titration curve (acid-base only) numericals on all above.

Unit 3: Polymers (08 Hrs.)
Definition and important terms: Monomer, Polymer, Polymerization, Degree of polymerization (Dp), Glass transition temperature (Tg), Molecular weight, Polymer dissolution.
Classification on the basis of - a) Polymerization mechanism – (step and chain polymers, brief mechanism should be explained), b) Polymerization reactions – (addition and condensation), c) Thermal behaviour – (thermoplastics and thermostetting), d) Types of monomers – (homopolymer and copolymer).
Commercial Polymers–Synthesis, properties and applications- Polyethylene (PE), Polypropylene (PP), Polyvinyl chloride (PVC), Polystyrene (PS), Phenol formaldehyde (PF), Acrylonitrile butadiene styrene (ABS), Epoxy resin. Compounding of Plastics.
Rubbers-Synthesis, structure, properties and applications of a) Natural rubber–isolation, Polyisoprene. b) Vulcanized rubber-Valcanisation of rubber by sulfur. c) Synthetic rubber-Styrene – Butadiene rubber, Silicon rubber and Neoprene rubber.

Speciality polymers – Basic concepts and applications of conductive, liquid crystalline, thermally stable and biodegradable polymers. Polymer composites, Recycling of polymers.

Term work: Any four experiments
1. To standardize KMnO₄ solution by preparing standard oxalic acid and to estimate ferrous ions.
2. To standardize Na₂S₂O₃ solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.
3. To determine phenol by iodometric method.
4. To determine molecular weight of a polymer using Ostwald viscometer.
5. Preparation of (any one) polystyrene, urea formaldehyde, phenol formaldehyde and its characterization.
6. To determine chloride ions from solution by Volhard method.
7. To determine calcium from the given sample of cement by volumetric method.

Term work is based on performance and regular checking of the experiments.

Reference Books:
2. Principles of the solid state, H.V. Keer (New age international publishers).
3. Polymer Science, V.R. Gowarikar (Wiley Eastern Ltd.).

Laboratory Manual:
Unit 4 : Interference and electron Optics
Interference:- Interference of waves, Interference due to thin films of uniform (with derivation) and non-uniform thickness (without derivation), Fringe width, Newton’s Rings, Applications of Newton’s Rings for determination of (i) wavelength of incident light / radius of curvature of Plano convex lens (ii) refractive index of a given liquid; Michelson’s interferometer, applications for determination of (i) wavelength of a monochromatic source (ii) refractive index /thickness of a transparent material; Engineering applications of interference (i) Testing of optical flatness of surfaces (ii) Nonreflecting / Antireflection coatings.
Electron Optics :- Motion of an electron in electric (parallel, perpendicular) and magnetic (extensive, limited) fields, crossed fields. Electrostatic and magneto static focusing, Scanning electron microscope (SEM), Bainbridge mass spectrograph.

Unit 5 : Diffraction and ultrasonic
Diffraction : - Diffraction of waves, classes of diffraction, Fraunhoffer diffraction at a single slit (geometrical method), conditions for maxima and minima, Intensity pattern due to a single slit, Plane diffraction grating, conditions for principal maxima and minima, intensity pattern; Resolving power, Resolving power of a grating.
Ultrasonics :- Ultrasonic waves, Piezo-electric effect, Production of ultrasonic waves by Piezoelectric oscillator, Magnetostrictive effect, Production of ultrasonic waves by magnetostrictive oscillator, properties of ultrasonic waves, Applications of ultrasonic waves (i) Scientific- Echo sounding, Sound signaling, depth sounding, SONAR, cleaning of dirt etc (ii) Engineering –thickness measurement, cavitation, Ultrasonic cleaning, Nondestructive testing, Flaw detection, Soldering, Drilling and welding (iii) Medical- for diagnostics and treatment
Note: Discuss any one application for 4 marks

Unit 6: Polarisation and nuclear physics
Polarisation :- Introduction, production of plane polarised light by refraction (pile of plates), Law of Malus, Double refraction, Huygen’s theory of double refraction, Cases of double refraction of crystal cut with the optic axis lying in the plane of incidence and (i) parallel to the surface (ii) perpendicular to the surface (iii) inclined to the surface, Retardation plates-quarter wave plate (QWP), Half wave plate (HWP); Analytical treatment of light for the production of circularly and elliptically polarised light, Detection of various types of light (PPL, CPL, EPL, UpL, Par PL), Optical activity, Specific rotation, Polaroids
Nuclear Physics :- Nuclear fission in natural Uranium-Chain reaction, Critical size. Nuclear fuels, Nuclear fusion, and thermonuclear reactions-P-P and CN cycles, Particle accelerators-cyclotron, betatron.

Reference Books:
1.Optics, Jenkins and White (Tata Mcgraw Hill)
2.Text Book of Optics, Brijlal and Subramanyam (S. Chand and Company)
3.University Physics, Young and Freedman (Pearson Education).
4.Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons).
5. Concepts of Modern Physics-Beiser (Tata Mcgraw Hill)

Term Work: Any Four experiments
1.Determination of wavelength by using diffraction grating.
3.Experiment on ultrasonic waves.
5.Determination of specific rotation by Laurent’s half shade polarimeter.
6.Demonstration of Lissajous figures (principles of interference and polarisation) using a CRO, phase measurement.
7.Michelson’s interferometer
8. Determination of e/m by Thomson’s method.
(Determination of polarising angle for glass and to determine refractive index of glass using Brewster’s law
Or Experimental verification of law of Malus).
10.Determination of wavelength of the given source by Fraunhoffer diffraction at a single slit.
Term work is based on performance and regular checking of the experiments.
University of Pune
First Year Engineering Course

110003: Fundamentals of Programming Languages

Teaching Scheme
Theory : 1 Hr/Week
Practical: 2 Hrs/Week

Examination Scheme
Practical : 50 Marks

Objectives
- To learn and acquire art of computer programming
- To know about some popular programming languages and how to choose a programming language for solving a problem using a computer
- To learn to program in C

1. Program Planning Concepts
   Algorithm; Advantages of Generalized Algorithms; How to Make Algorithms Generalized; Avoiding Infinite Loops in Algorithms – By Counting, By using a Sentinel Value; Different ways of Representing an Algorithm – As a Program, As a Flowchart, As a Pseudo code; Need for Planning a Program before Coding; Program Planning Tools – Flowcharts, Structure charts, Pseudo codes; Importance of use of Indentation in Programming; Structured Programming Concepts – Need for Careful Use of “Go to” statements, How all programs can be written using Sequence Logic, Selection Logic and Iteration (or looping) Logic, functions.

2. Programming Languages
   What is a Programming Language; Types of Programming Languages – Machine-level, Assembly-level and High-level Languages, Scripting Languages, Natural Languages; Their relative Advantages and Limitations; High-level Programming Language Tools – Compiler, Linker, Interpreter, Intermediate Language Compiler and Interpreter, Editor, Matlab, GUI; Overview of some popular High-level Languages – FORTRAN, COBOL, BASIC, Pascal, C, C++, JAVA, LISP; Characteristics of a Good Programming Language; Selecting a Language out of many Available Languages for Coding an Application; Subprograms.

3. Program Testing and Debugging
   Definition of Testing & Debugging; Difference between Testing and Debugging; Types of Program Errors; Testing a Program; Debugging a Program for Syntax Errors; Debugging a Program for Logic Errors, Concept of APIs/Libraries.

4. Program Documentation
   What is Documentation; Need for Documenting Programs and Software; Forms of Documentation – Comments, System Manual, User Manual; Documentation Standards and Notations.

5. Programming in C Language
   Character set, Constants, Variables, Keywords and Comments; Operators and Operator Precedence; Statements; I/O Operations; Preprocessor Directives; Pointers, Arrays and Strings; User Defined Data Types – Structure and Union; Control Structures – Conditional and Unconditional Branching Using “if”, “switch”, “break”, “continue”, “go to” and “return” Statements; Loop Structures – Creating Pretest Loops using “for” and “while” Statements; Creating Posttest Loops using “do...while” statement; Functions – Creating Subprograms using Functions; Parameter Passing by Value; Parameter Passing by Reference; Main Function.
Term Work

Term work shall consist of a record in the form of a journal consisting of at least twelve exercises/assignments on programming in C that includes flowcharts, pseudo codes and printouts of the programs and necessary documentation for the following exercises:

1. Write a C program to accept five numbers from console and then to display them back on console in ascending order.
2. Write a C program to calculate the sum of all numbers from 0 to 100 (both inclusive) that are divisible by 4.
3. Write a C program to accept the length of three sides of a triangle from console and to test and print the type of triangle – equilateral, isosceles, right angled, none of these.
4. Write a C program to accept a string from console and to display the following on console:
   a. Total number of characters in the string
   b. Total number of vowels in the string
   c. Total number of occurrence of character ‘a’ in the string.
   d. Total number of occurrence of string ‘the’ in the string.
5. Write a program in C to reverse the digits of a given integer.
6. Write a program in C to read an integer and display each of the digit of the integer in English.
7. Write a program in C to generate first 20 Fibonacci numbers
8. Write a program in C to generate prime numbers between 1 and n.
9. Write a program in C to compute the GCD of the given two integers
10. Write a program in C to compute the factorial of the given positive integer using recursive function.
11. Write a program in C to compute the roots of a quadratic equation.
12. Write a program in C to sort n integers using bubble sort.
13. Write a program in C to compute addition/subtraction/multiplication of two matrices. Use functions to read, display and add/subtract/multiply the matrices.
14. Write a program in C to carry out following operations on strings using library functions
   a. To concatenate a string S₂ to string S₁.
   b. To find the length of a given string
   c. To compare two strings S₁ and S₂.
   d. To copy a string S₂ to another string S₁.
15. A data file contains a set of examination scores followed by a trailer record with a value of -1. Write a C program to calculate and print the average of the scores.

The instructor may choose from the assignments given above and may modify them, if necessary.

Text Book


Reference Books

UNIVERSITY OF PUNE

THE SYLLABUS IS PREPARED BY:

BOS- Electrical Engineering,

SUBJECT : BASIC ELECTRICAL ENGINEERING (103004)

Note: This syllabus is subject to change without prior notice by the concerned BOS

BASIC ELECTRICAL ENGINEERING (103004)

Teaching scheme
Lectures - 3 Hrs/Week
Practical - 2 Hrs/Week

Examination scheme
Paper-100 Marks (3 Hrs. Duration)
Term work- 25 Marks

SECTION – I

Unit 1. General:
Concepts of emf., p.d. and current, resistance, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. S.I. units of work, power and energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems. Batteries and cells, their types, primary cells and secondary cells, Lead Acid, Ni-Cd and Ni-MH batteries, current capacity and cell ratings. Charging, importance of initial charging and discharging of batteries. Series and parallel battery connections, maintenance procedure. (6 Hrs)

Unit 2. D.C. Circuits:
Classification of electrical networks, Ohm's law, Kirchhoff’s law and their applications for network solutions. Simplifications of networks using series and parallel combinations and star-delta conversions, Superposition theorem, Thevenin’s theorem and maximum power transfer theorem. (8 Hrs)

Unit 3. Electromagnetism:
Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, solenoid and toroid. Concept of m.m.f., flux, flux density, reluctance, permeability and field strength, their units and relationships. Simple series and parallel magnetic circuits, comparison of electrical and magnetic circuit, force on current carrying conductors placed in magnetic field, Fleming’s left hand rule. Faraday’s laws of electromagnetic induction, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of couplings, energy stored in magnetic field. (7 Hrs)
SECTION – II

Unit 4. Electrostatics and AC fundamentals:

A) Electrostatics field, electric flux density, electric field strength, absolute permittivity, relative permittivity, capacitance and capacitor, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and time constant. (3 Hrs)

B) Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of instantaneous, peak(maximum), average and r.m.s. values, frequency, cycle, period, peak factor and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. rectangular and polar representation of phasors. (4Hrs)

Unit 5. Single phase A.C. Circuits:

Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage-current phasor diagrams and waveforms. Development of concept of reactance, study of series R-L, R-C, R-L-C circuit and resonance, study of parallel R-L, R-C and R-L-C circuit, concept of impedance, admittance, conductance and susceptance in case of above combinations and relevant voltage-current phasor diagrams, concept of active, reactive and apparent power and power factor. (7 Hrs)

Unit 6. Polyphase A.C. Circuits and Single phase Transformers:

A) Polyphase A.C. Circuits: Concept of three-phase supply and phase sequence. voltages, currents and power relations in three phase balanced star-connected loads and delta-connected loads along with phasor diagrams. (3 Hrs)

B) Single phase transformers: Construction, principle of working, e.m.f. equation, voltage and current ratios, losses, definition of regulation and efficiency, determination of these by direct loading method. descriptive treatment of autotransformers and dimmerstats. (4Hrs)

Term work:
The term work shall consist of record of minimum eight exercises and experiments, out of which Group A is compulsory and any five experiments from Group B should be conducted.

Group A
1. Wiring Exercises:
   a) Study of various wiring components (wires, switches, fuse, sockets, plugs, lamp holders, lamps etc. their uses and ratings).
   b) Control of two lamps from two switches (looping system).
   c) Staircase wiring.
   d) Use of Megger for insulation test and continuity test of wiring installations and machines.
2. a) Study of fluorescent tube circuit.
   b) Study of compact fluorescent lamp(CFL).
   c) Study of HID lamps such as mercury vapour lamp /sodium vapour lamp.
3. a) Study of safety precautions while working on electric installations and necessity of earthing.
   b) Introduction to energy conservation and simple techniques to achieve it.
Group B

4. Determination of temperature rise of medium resistance such as shunt field winding.
5. Verification of Kirchhoff’s laws and Superposition theorem.
6. Verification of Thevenin’s theorem.
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Single phase transformer
   a) Voltage and current ratios.
   b) Efficiency and regulations by direct loading.

Note: College should provide printed text and figures for Group A experiments and only printed text for Group B experiments.

Text Books:

Reference Books:
4. Principles of Electrical Engineering by Del. Toro, PH
101005 Basic Civil and Environmental Engineering

Teaching Scheme
Theory: 3 Hours/Week  
Practicals 2 Hours/Week

Examination Scheme
Paper 100 Marks  
Term Work: 25 Marks

Section I

Unit 1: Introduction to Civil Engineering  (6 hours)
  a) Role of Civil Engineer in the construction of buildings, dams, expressways and infrastructure projects for 21st century. Importance of an interdisciplinary approach in engineering.

Unit 2: Materials and Construction  (6 hours)
  a) Use of basic materials cement, bricks, stone, natural and artificial sand, Reinforcing Steel-Mild, Tor and High Tensile Steel. Concrete types - PCC, RCC Prestressed and Precast. Introduction to smart materials. Recycling of materials.
  b) Substructure - Function of Foundations, (Only concepts of settlement and Bearing capacity of soils.) Types of shallow foundations, (only concept of friction and end bearing pile).
  d) Introduction to automation in construction: Concept, need, examples related to different civil engineering projects.

Unit 3: Uses of maps and field surveys  (6 hours)
  b) Conducting simple and differential levelling for setting out various benchmarks, determining the elevations of different points and preparation of contour maps. Introduction to GIS Software and other surveying softwares with respect to their capabilities and application areas.
Section II

Unit 4: Ecology and Eco System (6 hours)
b) Introduction to solid waste management, Disposal of electronic wastes.

Unit 5: Planning for the Built Environment (6 hours)

Unit 6: Energy and Environmental Pollution (6 hours)
a) Types of energy:- conventional and non-conventional. Need for harnessing alternative energies to meet the increased demand. Methods of harnessing energies.
b) Sources, causes, effects and remedial measures associated with
1. Air Pollution
3. Noise Pollution
4. Land Pollution

Term Work:
Any 8 Practical Exercises from those given below should be carried out, record to be submitted in the field book and file which will form a part of termwork.

1. Study of any 4 types of maps and writing their uses.
2. Exercise on use of dumpy level and laser level.
5. Determination of coordinates of a traverse using Global Positioning system (GPS)
6. Measurement of distance by EDM and comparing it with the distance measured using tape.
7. Visit to a construction site for studying the various construction materials used, type of structure, type of foundation and components of superstructure – submission of visit report.
8. Demonstration of use of any 4 Civil Engineering softwares.
9. Making a poster (Full imperial sheet size) in a group of 4 students, related to Energy/Environment.
10. Presentation in a group of 4 students, any case study related to Energy/Environment.

TEXT BOOKS:
1. Surveying and Levelling --- Kanetkar and Kulkarni, PVG Prakashana
2. Environmental Studies D.L.Manjunath – Pearson Education.
REFERENCE BOOKS:
NOTE – Only FIRST ANGLE METHODS OF PROJECTIONS ARE TO BE USED IN ALL THE UNITS.

SECTION – I

UNIT – I Drafting Technology and Introduction to Any Drafting Software/Package
Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Tolerances – methods of representing tolerances, unilateral and bilateral tolerances, tolerance on linear and angular dimensions, geometrical tolerances. Symbols used on drawing, surface finish symbols, welding symbols.

Advantages of using Computer Aided Drafting (CAD) packages, applications of CAD, basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

UNIT – II Curves used in Engineering Practice [ 15 Marks ]
Ellipse, Parabola, Hyperbola, normal and tangents to these curves, Involute, Cycloid, Epi-cycloid, Hypo-cycloid, Archimedean Spiral, Helix on cone and cylinder.

UNIT – III Orthographic Projections [ 20 Marks ]
Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method, Sectional orthographic projections – full section, half section, offset section.

UNIT – IV Auxiliary Projections [ 15 Marks ]
Auxiliary planes – Auxiliary Vertical Plane (AVP), Auxiliary Inclined Plane (AIP), symmetrical auxiliary view, unilateral auxiliary view, bilateral auxiliary view.

SECTION – II

UNIT – V Isometric Projections [ 20 Marks ]
Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.

UNIT – VI Interpretation of Given Views/Missing Views [ 20 Marks ]
Identification of lines/edges and surfaces, visualization of given orthographic views, adding a missing/third view, adding a sectional view, to convert a given view in to a sectional view.

UNIT – VII Freehand Sketching [ 10 Marks ]
Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints.
Term Work:

Five A2 (594X420mm) (Half imperial) size drawing sheet as detailed below:

Sheet No. 1 : CURVES
To draw any four curves mentioned in the detailed syllabus.

Sheet No. 2 : ORTHOGRAPHIC VIEWS
To draw two principal views, one sectional view for two objects.

Sheet No. 3 : AUXILIARY VIEWS
To draw auxiliary views from the given views for any two objects.

Sheet No. 4 : ISOMETRIC VIEWS
Two problems on Isometric views.
(minimum one problem by using CAD software/package)

Sheet No. 5 : INTERPRETATION OF GIVEN VIEWS/MISSING VIEWS
Two problems on Interpretation of given views.
(minimum one problem by using CAD software/package)

Text Books:
2. D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd..

Reference Books:
UNIVERSITY OF PUNE
Syllabus for Engineering Degree Course – Revision 2008
F.E. Semester – II: 107008 – Engineering Mathematics – II

Teaching Scheme: Lectures – 4 Hrs./Week
Examination Scheme: Paper – 100 Marks(3 Hrs. Duration)

Unit 1
Differential Equations (DE): Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

Unit 2

Unit 3

Integral Calculus: Reduction formulae, Beta and Gamma functions.

Unit 4
Integral Calculus: Differentiation Under the Integral Sign, Error functions.

Unit 5

Multiple Integrals and their Applications: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, Mass, Center of Gravity and Moment of Inertia.

Text Books:
Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

Reference Books:
Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

**************************************************************************************************
Teaching scheme:
Lectures – 4 Hrs./Week
Practicals- 2Hrs./Week

Examination scheme:
Paper – 100 Marks (3Hrs)
T.W. 25 Marks

Both schemes are exactly half for Chemistry and Physics each

Chemistry

Unit 1: Fuels and combustion (08 Hrs.)

Fuels: Definition, classification of fuels, calorific value and its units. Determination of calorific value – Bomb calorimeter, Boy’s colorimeter – numericals. Solid fuels: Coal, classification of coal, proximate and ultimate analysis of coal, numericals based on analysis of coal - Dulon g and Goutel formula. types of carbonisation of coal-low temperature and high temperature carbonization. Liquid fuels: Origin of petroleum, composition of petroleum, refining of petroleum, octane number of petrol, cetane number of diesel, power alcohol, biodiesel. Gaseous fuels: Composition, properties and applications of natural gas, treatment products such as CNG, LPG, LNG. Hydrogen gas as a fuel, production, properties, storage and transportation. Rocket propellants-characteristics, classification. Combustion: Chemical reactions, calculation on air requirement for combustion – numericals

Unit 2: Corrosion and its prevention (08 Hrs.)

Corrosion:- Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment, Pourbaix diagram.

Methods of prevention of corrosion-cathodic and anodic protection. Metallic coatings, Electroplating, Hot dipping, blacodizing, powder coating Surface conversion coating.

Unit 3: Water and phase rule (08 Hrs.)


Phase rule: Gibb’s Phase rule and the terms involved in it with examples. One component system – Water and Sulphur. Reduced phase rule. Applications and limitations of phase rule.

Term Work: Any four experiments

1. To determine total alkalinity of water sample.
2. To determine chloride content of water sample by Mohr’s method.
3. To determine temporary and permanent hardness of water sample by EDTA method.
4. Spectrophotometric / colorimetric estimation of Fe+++ from the given solution.
5. To construct a phase diagram for a binary system, naphthalene and benzoic acid and find eutectic point.
6. Study of corrosion of metals in medium of different pH.
7. Analysis of mixture of phosphoric acid and hydrochloric acid using indicators and pH meter separately.
8. To determine moisture, volatile matter and ash content of a given sample of coal.

Term work is based on performance and regular checking of the experiments.

Reference books:
1. Materials science and engineering an introduction, William D. Callister, (Jr.,Wiley. publisher)
2. Principles of the solid state, H.V. Keer, (New age international publishers).
4. Text book of Physical chemistry, Samuel Glasstone (Mcmillon and Co. Ltd.)

Laboratory manual
1. Laboratory manual on Engineering Chemistry, Sudharani (Dhanpat Rai publishing company)
Unit 4: Wave particle duality and wave equations

Wave Particle Duality: Wave particle duality of radiation and matter, concept of group velocity and phase velocity; Uncertainty principle, Illustration of electron diffraction at a single slit.

Wave Equations: Concept of wave function and probability interpretation, Physical significance of the wave function, Schrodinger’s time independent and time dependent wave equations, Applications of Schrodinger’s time independent wave equations to problems of (i) Particle in a rigid box (infinite potential well), Comparison of predictions of classical mechanics with quantum mechanics (ii) Particle in a non-rigid box (finite Potential Well)- Qualitative (results only);

Unit 5: Lasers and superconductivity


Superconductivity: Introduction to superconductivity, Properties of superconductors (zero resistance, Meissner effect, critical fields, persistent currents), isotope effect, BCS theory. Type I and type II Superconductors, Applications (super conducting magnets, transmission lines etc), DC and AC Josephson effect

Unit 6: Semiconductor physics and physics of nanoparticles

Semiconductor physics: Band theory of solids, Classification of solids on the basis of band theory, Types of semiconductors, Introduction to the concept of electrical conductivity, conductivity of conductors and semiconductors. Hall effect and Hall coefficient, Fermi-Dirac probability distribution function, Position of Fermi level in intrinsic semiconductors (with derivation) and in extrinsic semiconductors (variation of Fermi level with temperature (without derivation)), Band structure of PN junction diode under zero bias, forward bias and reverse bias; Transistor working, PNP and NPN on the basis of band diagrams, Photovoltaic effect, working of a solar cell on the basis of band diagrams and Applications.


Reference Books:
1. Principles of Physics, Serway and Jewett (Saunders college publishing)
2. Introduction to Solid State Physics, Kittel C (Wiley and Sons)
3. Laser and Non-Linear Optics, B.B. Laud (Oscar publication)
4. Physics of the Atom, Wehr and Richards (Addison, Wesley)

Term Work: Any four experiments

1. Determination of band gap of a semiconductor.
2. Characteristics of a solar cell, calculation of fill factor, To plot power vs. resistance graph and hence to calculate value of R for maximum value of workable power.
3. Hall effect and determination of Hall coefficient.
5. Diode characteristics (Ge/Si, LED, Zener)
6. Synthesis of metal nanoparticles (gold/silver) by the chemical route.
8. To find refractive index of glass using a laser (using Snell’s law). (may show demonstrations of polarisation and diffraction).
9. An experiment based on laser (e.g.: To find number of lines /cm of a given grating using a laser source/ to find beam divergence/true beam width )

Term work is based on performance and regular checking of the experiments.
Engineering Mechanics (101010)

Teaching Scheme
Theory : 03 hrs/week
Practical: 02 hrs/week

Examination Scheme
Paper : 100 marks
Term Work: 25 marks

Section-I (Statics)

Unit 1. Resultant of coplanar force system. (06 Hrs)
A. Principle of statics, Force systems, Resolution and composition of forces, Resultant of concurrent forces.
B. Moment of a force, Couple, Varignon’s theorem, Equivalent force couple system, Resultant of parallel and general force system, Distributed forces, Centroid of plane lamina and wire bends.

Unit 2. Equilibrium of Force system. (06 Hrs)
A. Free body diagram, Equilibrium of concurrent, parallel and general forces in a plane, Equilibrium of three forces in a plane, Types of beams, simple and compound beams, type of supports and reaction.
B. Resultant and Equilibrium of concurrent and parallel forces in a Space.

Unit 3. Analysis of structure and friction. (06 Hrs)
A. Two force member, Analysis of plane trusses by method of joint and method of section, cables subjected to point loads.
B. Friction - Application of friction on inclined plane, wedges, ladders and flat belt.

Section-II (Dynamics)

Unit 4. Rectilinear motion of particles. (06 Hrs)
A. Kinematics- Basic concepts, Equations of motion for constant acceleration and motion under gravity, Variable acceleration, Motion curves, Relative motion and dependant motion.
B. Kinetics- Newton’s second law of motion and its applications.

Unit 5. Curvilinear motion of particles. (06 Hrs)
A. Kinematics-Basic concepts, Equation of motion in cartesian, path and polar coordinate, Motion of projectile.
B. Kinetics-Newton’s second law of motion. Motion in cartesian and path coordinate of a particle.

Unit 6. Work energy and impulse momentum principle for particle. (06 Hrs)
B. Linear Impulse & Momentum, Conservation of momentum, Direct central impact and coefficient of restitution, Impulse momentum principle.

Term Work

a) Statics-(Any three experiments from the list below)
   1. Verification of law of parallelogram of forces/polygon of forces.
   2. Support reaction of simple / compound beams.
   3. Determination of coefficient friction of belt/inclined plane.
   4. To determine forces in Space Force System.

b) Dynamics-
   1. Curvilinear motion.
2. Determination of coefficient of restitution.

c) Exercise- At least two examples on each part of the units should be solved during practical hours under the guidance of the concerned teacher.
d) Assignment- Minimum five numerical examples from each unit given by concerned teacher.

Note: Examples in Exercise and Assignment should be unsolved problems from text and reference books prescribed in the syllabus.

Text book (latest editions)

Reference books
3. Engineering Mechanics statics and dynamics by J. L. Meriam and Craige, John Willey and Son’s publication.
1. Diodes & Circuits

2. Semiconductor devices & applications

3. OP AMPS and applications

4. Digital Electronics
CMOS NOT, NAND, NOR, AND, OR, EXOR gates, De Morgan’s theorem. Technologies-SSI, MSI, LSI, VLSI. Half adder, full adder, mux, demux, D flip flop, shift registers, counters. Block diagram of Microprocessor & Microcontroller. Advantages of using them.

5. Industrial applications
Transducers for-Temperature, level, displacement, pressure. Range, specifications, Limitations & applications. Block diagrams of-Digital thermometer, weighing machine. Introduction & block diagram of-Two wire transmitter, PID controller, data logger, alarm annunciator, CNC machine, PLC.

6. Communication systems
List of Practical:

2. Study of semiconductor devices I- Study of data sheet specifications of- Diodes, BJT, FET, OPAMP. Build and test positive/negative regulator with bridge rectifier and filter.
4. Build and test BCD counter with 7 segment LED display.
5. Study of controls of CRO. Measurement of- frequency, Phase, AC and DC voltages.
7. Build and test half and full adder circuit.
8. Soldering practice and Study of soldering techniques.

Books

1. Art of Electronics- Paul Horowitz, Cambridge LPE
2. Electronics Devices and Circuits An Introduction – Allen Mottershed, PHI
Engineering Graphics – II (102012)

Teaching Scheme

<table>
<thead>
<tr>
<th>Lectures</th>
<th>1 Hours/Week</th>
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<tbody>
<tr>
<td>Practical</td>
<td>2 Hours/Week</td>
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Examination Scheme

| Term Work | 50 Marks |

NOTE – ONLY FIRST ANGLE METHOD OF PROJECTIONS IS TO BE USED IN ALL THE UNITS.

UNIT – I  Projections of Point and Line

Projections of points, projections of lines, lines inclined to one reference plane, lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Distance between skew lines.

UNIT – II  Projections of Planes

Projection of planes, angle between two planes, distance of a point from a given plane, inclination of the plane with HP and VP, True shape of a plane surface.

UNIT – III  Projections of Solids

Projections of solids inclined to one reference plane, inclined to both the reference planes, projections of cube, right regular prisms, right regular pyramids, right circular cylinder, right circular cone, tetrahedron, frustum of solids.

UNIT – IV  Sections of Solids

Types of section planes, projections of above solids cut by different section planes, True shape of cut surfaces.

UNIT – V  Development of Lateral Surfaces (DLS) of Solids.

Applications of DLS, method of development, development of lateral surface of above solids, development of lateral surface of cut solids.

Term Work:

Term Work should be prepared on Five A2 (594X420mm) (Half imperial) size drawing screen using any drafting software/package as detailed below.

- Sheet No. – 1 Projection of Line Minimum 2 Problems
- Sheet No. – 2 Projections of Planes Minimum 2 Problems
- Sheet No. – 3 Projections of Solids Minimum 2 Problems
- Sheet No. – 4 Sections of Solids Minimum 2 Problems
- Sheet No. – 5 DLS of Solids Minimum 2 Problems

Important Note: The problems for Term Work should be different for each student.
The Term Work of a batch should be preserved in a form of CD/DVD and the same should be produced before a TW Verification Committee appointed by the University.

Text Books:
2. D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd..

Reference Books:
(102013) Basic Mechanical Engineering

Teaching Scheme:  
Theory::  3 Hours  
Practical:  2 Hours

Examination scheme  
Theory: 100 marks (3 hours)  
TW:  25 marks

Unit 1  
Thermodynamics  
Thermodynamic work, p-dV work in various processes, p-V representation of various thermodynamic processes and cycles  
Ideal gas equations, Properties of pure substance, Statements of I and II laws of thermodynamics and their applications in Mechanical Engineering.  
Carnot cycle for Heat engine, Refrigerator and Heat pump.  

[18 Marks]

Unit 2  
Energy conversion devices (Theoretical study using schematic diagrams only)  

[16 Marks]

Unit 3  
Heat Transfer  
Statement and explanation of Fourier’s law of heat conduction, Newton;s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties. Selection of heat sink and heat source.  
Power Plants ( Description with Block Diagrams)  
Thermal, Hydroelectric, Nuclear and Solar-Wind Hybrid Power Plants.  

[16 Marks]

Unit 4  
Machine elements:  
Power transmission shafts, axles, keys, bush and ball bearings, Flywheel and Governors.  
Power Transmission Devices  
Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and single plate), brakes (types and applications only)  
Applications of these devices.  
Mechanisms: (Descriptive treatment only)  
Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism  

[16 Marks]
Unit 5
Materials Used in Engineering and their Applications
Metals – Ferrous and Non-Ferrous, Nonmetallic materials, Material selection criteria

Design considerations

Steps in Design

Introduction to manufacturing processes and Their Applications:
Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.

[18 Marks]

Unit 6
Machine Tools (Basic elements, Working principle and types of operations)
Lathe Machine – Centre Lathe
Drilling Machine – Study of Pillar drilling machine
Introduction to NC and CNC machines
Grinding machine, Power saw, Milling Machine.

[16 Marks]

Term work: Term work shall consist of record of any eight experiments out of the following;

1. Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
2. Finding relation between input angle and output angle for various link lengths
3. Demonstration of operations of centre lathe (turning, step turning, facing, boring, taper turning, knurling, grooving, threading)
4. Demonstration of operations on drilling machines (drilling, reaming, spot facing, counterboring)
5. Demonstration of Two stroke and four stroke engine
6. Study of Package type boilers
7. Study of domestic refrigerator & window air-conditioner
8. Study of power transmitting elements: Coupling, Gears and bearings.
9. Joule’s porous plug experiment
10. Joule’s paddle wheel experiment.
11. Experimental verification of effect of insulating material on heat transfer

References:
Text Book:
Hajra-Chaudhari “Workshop Technology”

Reference Books:
Communication Skill

Teaching Scheme:
Practical: 02 Hrs.

The teacher shall explain in detail, the gist and techniques involved in the following work units to the students. The Students should complete practical work based on the following topics. The teacher shall subsequently formulate the exercises to adjudge the skill sets acquired by the students. These exercises will be undertaken by the groups of the students of suitable strength.

Work Unit 1- Fundamentals of Communication:
Elements of communication, types of Communication- diagonal, downward, upward, horizontal communication. Importance of effective communication, manners and etiquettes in communication, stages of communication, ideation, encoding, transmission, decoding, response, general communication, technical communication., barriers to effective communication, Listening skill, speaking skill, Reading skill, writing skill.

Work Unit 2- Organization and Listening Comprehension in Communication:
Spatial organization, chronological organization, order of increasing and decreasing importance, styles of communication, accuracy, brevity, clarity, objectivity, impersonal language, professional speaking ability, listening process, hearing and listening, types of listening- superficial, appreciative, focused, evaluative, attentive, empathetic. Barriers to listening- physical, psychological, linguistic, cultural. Speech decoding, oral discourse analysis, effective listening strategies, listening in conversational interaction, listening to structured talks, pre-listening analysis, predicting, links between different parts of the speech, team listening, listening and notes taking.

Work Unit 3- Speaking Skills:
The speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self expression, body language phonetics and spoken english, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, Job interview, interview process, characteristics, of the job interview, pre-interview preparation techniques, interview questions and answers, positive image projection techniques. Group discussion- characteristics, subject knowledge, oral and leadership skills, team management, strategies, individual contribution. Presentation skills-planning,preparation, organization, delivery.

Work Unit 4- Reading and language skills:
The reading process, purpose, different kinds of texts, reference material, scientific and technical texts, active and passive reading, strategies-vocabulary skills, eye reading and visual perception., prediction techniques, scanning skills, distinguishing facts and opinions, drawing inferences and conclusions, comprehension of technical material- scientific and technical texts, instructions and technical manuals, graphic information. Note making- tool for study skills, topicalising, organization and sequencing. Summarizing and paraphrasing.

Work Unit 5 - Referencing and Writing skills:
Methods of referencing, book references, user guides, references for reports, journal references, magazines and newspapers, unpublished sources, internet references, explaining and elucidating.
Writing skills - Sentence structure, sentence coherence, emphasis. Paragraph writing, letter writing skills - form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales letters.
Work Unit 6 – Reports, Resumes and Job Applications:
Types of reports, information and analytical reports, oral and written reports, formal and non formal reports, printed forms, letter and memo format, manuscript format, proposals, technical articles, journal articles and conference papers, review and research articles.
E-mails, Business Memos, Employment Communication- resume design, resume style,

Reference Book:

3. ‘Developing Communication Skills’ Krishna Mohan, Meera Banerji, McMillan India Ltd.
4. ‘Principles and Practice of management’ Dr. P. C. Shejwalkar, Dr. Ghanekar and Dr. Bhivapathaki, Everest publishing House