SAVITRIBAI PHULE PUNE UNIVERSITY

First Year Engineering

Credit System Syllabus

2015 Course

$: Mandatory subjects of first, second and third semester must include at least 40 credits for Engineering Physics, Engineering Chemistry, Engineering Mathematics, social science and soft skills
In addition to above credits, there should be audit courses in semester five, six and seven to develop the various skills.
The detail structure is given in Tables

TABLE - 2 Structure for Semester-1

	Code	Subjects	Short Name	Weekly Work Load (in Hrs)			Semester Examination Scheme of Marks						Credits
							Theory						
				Lectures	Tutorials	PR/DRG	In-Semester Exam	End-Semester Exam	TW	PR	OR	Max. Marks	
	107001	Engineering Mathematics I		4	1	–	50	50	25	–	–	125	5
#	107002 / 107009.	Engineering Physics OR Engineering Chemistry		4	–	2	50	50	25	–	–	125	5
	102006	Engineering Graphics I		3	–	2	50	50	–	-	–	100	4
#	103004 / 104012	Basic Electrical Engineering OR Basic Electronics Engineering		3	–	2	50	50	25	–	–	125	4
	101005	Basic Civil and Environmental Engineering		3	–	2	50	50	25	–	–	125	4
	110003	Fundamentals of Programming Languages I		1	–	2	-	-	–	50*	–	50	2
	111007	Workshop Practice		–	–	2	–	–	50	–	–	50	1
	Total of Semester I			18	1	12	250	250	150	50	–	700	25

TABLE - 3 Structure for Semester-2

	Code	Subjects	Short Name	Weekly Work Load (in Hrs)			Semester Examination Scheme of Marks						Credits
							Theory		TW	PR	OR	Max. Marks	
				Lectures	Tutorials	PR/ DRG	In-Semester Exam	End-Semester Exam					
	107008	Engineering Mathematics II		4	–	–	50	50	–	–	–	100	4
#	107009 / 107002	Engineering Chemistry OR Engineering Physics		4	–	2	50	50	25	–	–	125	5
	102013	Basic Mechanical Engineering		3	–	2	50	50	25	-	–	125	4
	101011	Engineering Mechanics		4	–	2	50	50	25	–	–	125	5
#	104012 / 103004.	Basic Electronics Engineering OR Basic Electrical Engineering		3	–	2	50	50	25	–	–	125	4
	110010	Fundamentals of Programming Languages II		1	–	2	-	-	-	50*	–	50	2
	102014	Engineering Graphics II		–	–	2	–	–	50	–	–	50	1
	Total of Semester II			19	–	12	250	250	150	50	–	700	25

Instructions:

1. PR/Tutorial must be conducted in minimum three batches (batch size 22 maximum) per division
2. Minimum number of required Experiments/Assignments in PR/DRG/Tutorial be carried out as mentioned in the syllabi of related subjects.
3. * for FPL-I and FPL-II: S.P. Pune University Online Practical Examination shall be conducted at the semester end.
4. # Every student should appear for Engineering Physics, Engineering Chemistry, Basic Electronics Engineering and Basic Electrical Engineering during the year.
5. # College is allowed to distribute Teaching Workload of subjects Physics, Chemistry, BEE, BXE in semester I and II by dividing number of FE divisions appropriately in two groups.

UNIVERSITY OF PUNE
First Year Engineering
107001 – Engineering Mathematics – I

Teaching Scheme:
Lectures – 4 Hrs./Week
Tutorials – 1 Hr./Week

Examination Scheme:
Paper – 50 Marks (2 Hrs.)
Online – 50 Marks
Term work: 25 Marks

Course Objectives:

After completing this course student will have adequate background to understand and solve the problem involving:

1) System of linear equations arising in all engineering fields, using matrix methods, stability of engineering systems where knowledge of Eigen values and Eigen vectors are essential.
2) Algebraic and transcendental equations.
3) Error analysis and approximations.
4) Ordinary and partial differential equations.
5) Engineering applications such as vibration theory, heat transfer, electrical circuits etc.
6) Stationary values of functions (Maxima & Minima), arising in optimization problems.

Unit I **(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 II **(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 III **(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 IV **(09 Hrs.)**

Expansion of Functions: Taylor's Series and Maclaurin's Series.
Differential Calculus: Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

Unit V **(09 Hrs.)**

Partial Differentiation and Applications: Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables.

Unit VI **(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.

Tutorial and Term Work:

i) Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.
ii) Term work shall consist of six assignments on each unit-I to unit-VI and is based on performance and continuous internal assessment.

Text Books:

1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
4. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune)

****

UNIVERSITY OF PUNE
First Year Engineering
107002 – Engineering Physics

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

Examination scheme:
Paper – 50 Marks (2hrs.)
Online – 50 marks
T.W. – 25 Mark

Course Objectives:

1) To provide the basic concepts to resolve many engineering and technological problems.
2) After completing this course students will be able to appreciate and use the methodologies to analyze and design a wide range of engineering Systems.
3) To use various techniques for Measurement, Calculation, Control and Analysis of engineering problems based on the principles of Optics, Ultrasonic, Acoustics, Quantum Physics, Superconductivity, Laser, Physics of nano particles and Semiconductor Physics.
4) To understand the recent trends and advances in technology, this requires precise control over dynamics of macroscopic engineering systems.
5) Basic sciences like Physics also invoke manipulation of processes over micro- and even nano-scale level as there is a growing demand of solid understanding of principles of basic sciences.
6) Physics provides the basic ideas and gives the solution for developing mathematical and analytical abilities with higher precision.

Unit – I: Interference- Diffraction and its Engineering application: **(8Hrs.)**

Interference

Introduction, Concept of thin film, Interference due to thin films of uniform thickness (with derivation), Interference due to wedge shaped thin films (qualitative), fringe width (with derivation), Formation of colors in thin films, Newton's rings, its applications i) for the determination of wavelength of incident light or radius of curvature of a given plano-convex lens , ii) for the determination of refractive index of a given liquid, Applications of Interference i) Testing of optical flatness of surfaces, ii) Thickness of thin film, iii) anti-reflection coating.

Diffraction

Diffraction of waves, classes of diffraction, Fraunhofer diffraction at single slit (geometrical method) Conditions for maxima & minima, Intensity pattern due to single slit, diffraction at circular aperture, plane diffraction grating(qualitative only), Conditions for maxima & minima, Intensity pattern, Scattering of light as an application of diffraction (qualitative only).

Unit—II: Sound Engineering **(8Hrs.)**

Definitions: Velocity, frequency, wavelength, intensity, loudness (expression), timber, of sound, reflection of sound, echo, Reverberation, reverberation time, Sabine's formula(qualitative only), remedies over reverberation Absorption of sound, absorbent materials, Conditions for good acoustics of the building, Noise, its effects and remedies, Ultrasonics – Production of ultrasonics by Piezo-electric and magnetostriction oscillator, Detection of ultrasonics, Engineering applications of Ultrasonics (Non-destructive testing, cavitations, measurement of gauge).

Unit – III: Polarization & Laser **(8Hrs.)**

Polarization:

Introduction, Polarization of waves, Polarization of light, Representation of PPL,UPL & partially polarized light, Production of PPL by i) Reflection, ii)Refraction(pile of plates),iii)Selective absorption (dichroism) iv)Double refraction, Law of Malus, Huygen's theory of double refraction cases of double refraction of crystal cut with the optic axis lying in the plane of incidence & i)Parallel to surface ii)Perpendicular surface iii) Inclined to surface , retardation plates, QWP, HWP, optical activity, specific rotation(qualitative only), optically active materials, LCD (as an example of polarization).

LASER

Absorption, spontaneous emission, requirement for lasing action (stimulated emission, population inversion, metastable state, active medium, resonant cavity, pumping) characteristics of laser :- monochromaticity, coherence, directionality, brightness, various levels of laser systems with examples i) two levels laser system – semiconductor laser, ii) three level laser system :– ruby laser, iv) four level laser system :- He-Ne laser.

Applications in Industry (drilling, welding, micromachining etc), Medicine (as a surgical tool), Communication (Principle and advantages only), Information Technology (Holography- Recording and reconstruction).

Unit IV: Solid State Physics **(8Hrs.)**

Band theory in solids, free electron theory (qualitative) electrical conductivity in conductor and semiconductor, influence of external factors on conductivity (temperature, light and impurity), Fermi energy, density state (qualitative) concept of effective mass, electrons and holes, Fermi-Dirac probability distribution function (effect of temperature on Fermi level with graph), Position of Fermi level in intrinsic semiconductor (with derivation) and extrinsic semiconductors, Dependence of Fermi level on temperature and doping concentration (qualitative), diffusion and drift current (qualitative), band structure of PN junction diode under i) zero bias, ii) forward bias, iii) reverse bias, Working of transistor (NPN only) on the basis of Band diagram, Hall effect (with derivation), photovoltaic effect working of solar cell on the basis of band diagram and its applications.

Unit V: Wave Mechanics **(8Hrs.)**

Wave particle duality of radiation & matter, De Broglie's concept of matter waves, expressing de Broglie wavelength in terms of kinetic energy and potential, concept and derivation of group and phase velocity, group and phase velocity of matter waves , Heisenberg's uncertainty principle, Illustration of it by electron diffraction at single slit, why an electron cannot exist in the nucleus, concept of wave function ψ and probability interpretation of $|\psi|^2$, Schrodinger's time independent and dependant wave equations, applications of Schrodinger's time independent wave equation i) Particle in 1-D rigid box (infinite potential well), Comparison of quantum mechanical and classical mechanical predictions ii) Particle in 1-D non rigid box (finite potential well- qualitative, results only), tunneling effect, example of tunneling effect in tunnel diode and scanning tunneling microscope.

Unit- VI: Superconductivity and Physics of nanoparticle. **(8Hrs.)**

Superconductivity:

Introduction to Superconductivity, Properties of superconductors (zero resistance, Meissner effect, critical fields, persistent currents), isotope effect, BCS theory, Type I & Type-II Super conductors, Applications (super conducting magnets, transmission lines etc.) DC & AC Josephson Effect.

Physics of nano- particles:

Introduction, Nanoparticles, Properties of nanoparticles: Optical, electrical (quantum dots, quantum wires), magnetic, structural, mechanical, brief introduction to different methods of synthesis of nano-particles such as physical, chemical, biological, mechanical. Synthesis of colloids, Growth of nano-particles, Synthesis of metal nano-particles by colloidal route, Application of nanotechnology-electronics, energy, automobiles, space & defense, medical, environmental, textile, cosmetics.

List of the experiments

Conduct any ***Eight*** experiments from the following

1. Newton's rings
2. Plane diffraction grating for the determination of unknown wavelength
3. Law of Malus
4. Brewster's law
5. Double refraction (Determination of refractive indices, identification of types of crystal)
6. Half shade polarimeter
7. Laser based experiment (beam divergence)
8. Laser based experiment-(thickness of wire / determination of no of lines / cm of a grating)
9. Ultrasonic interferometer for the determination of compressibility of liquid:- $\beta = 1 / (\rho v^2)$ where, v is the velocity of ultrasonic waves through liquid and ρ is density of liquid.
10. Measurement of sound pressure level
11. Determination of band gap of a given semiconductor
12. Hall effect
13. Solar cell characteristics, measurement of V_{OC}, I_{SC}, fill factor
14. Temperature dependence characteristics of semiconductor laser
15. Determination of absorption coefficient of sound of given material

Text Books:-

1. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
2. Engineering Physics, Gaur, Gupta, Dhanpat Rai and Sons Publications

References Books:-

1. Optics, Jenkins and White (Tata Mcgraw Hill)
2. Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons)
3. Principles of Physics, Serway and Jewett (Saunders college publishing)
4. Introduction to Solid State Physics, Kittel C (Wiley and Sons)
5. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)
6. Nanotechnology, Principles and Practices, Dr. S.K. Kulkarni (Capital Publishing Company)

UNIVERSITY OF PUNE
First Year Engineering
107009 - Engineering Chemistry

Teaching Scheme:
Lectures – 4 Hrs. / Week
Practical – 2 Hrs. /Week

Examination Scheme:
Theory – 50 marks (2 Hrs.)
Online – 50 marks
T.W. – 25 marks

Course Objectives:

After completing this course students will be able to understand:

1) Technology involved in improving quality of water for its industrial use.
2) Basic concepts of Electro analytical techniques that facilitate rapid and reliable measurements.
3) Chemical structure of polymers and its effect of on their various properties when used as engineering materials. To lay foundation for the application of polymers for specific applications and as composite materials.
4) Study of fossil fuels and derived fuels with its properties and applications.
5) An insight into nano materials and composite materials aspect of modern chemistry.
6) The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing corrosion.

Unit 1: Water technology & Green Chemistry (8Hrs.)

Water technology:

Impurities in water. Hardness of water and its determination by EDTA method, Alkalinity of water and its determination. Numericals. Ill effects of hard water in boilers. Boiler feed water treatment -1) Internal treatment –calgon, colloidal and phosphate conditioning, 2) External treatment- a) Zeolite process & its numericals b) Ion exchange method. Desalination of brackish water /Purification of water by Reverse osmosis and Electrodialysis.

Green Chemistry:

Definition, goals of green chemistry, efficiency parameters, need of Green Chemistry Major uses – traditional and green pathways of synthesis of adipic acid, polycarbonate, indigo dye.

Unit 2: Electro analytical techniques (8Hrs.)

Intoduction: Types of reference electrode(calomel electrode), indicator electrode (glass electrode), ion selective electrode, Half cell reaction and complete cell reaction.

Conductometry: Introduction, Kohlrausch's law, conductivity cell, measurement of conductance, Applications- Conductometric titrations, acid-base titrations, precipitation titrations.

pH-metry: Preparation of Buffers, standardization of pH meter, mixture of acids verses strong base titration, differential plots.

Potentiometry: Introduction, Potentiometric titrations- differential plots, Applications- redox titrations Fe/Ce titration.

UV/Visible spectroscopy: Interaction of radiation with matter, Beer lambert's law, chromophore and auxochrome, types of electronic transitions. Instrumentation and principle – block diagram of single and double beam spectrophotometer. Applications of uv-visible spectroscopy.

Unit 3 : Synthetic Organic Polymers (8Hrs.)

Introduction, functionality of monomer, polymerization- free radical mechanism and step growth polymerization. Concept and significance of –Average molecular weight, crystallinity in polymers, Tm and Tg. Thermoplastic and Thermosetting polymers. Compounding of plastics. Techniques of polymerization. Preparation, properties and engineering applications of: Polyethylene (LDPE & HDPE) and Epoxy resin. Elastomers –natural rubber- processing and vulcanization by sulphur. Synthetic rubbers- SBR.

Speciality polymers: Engineering thermoplastics– Polycarbonate, Biodegradable polymers– Poly(hydroxybutarate-hydroxyvalanate), Conducting polymers– Polyacetylene, Electroluminscent polymers– Polyphenylenevinylene, Liquid crystalline polymers– Kevlar, Polymer composites– Fibre reinforced plastic (FRP).

Unit 4: Fuels and combustion (8Hrs.)

Fossil Fuels: Definition, Calorific values, Determination– Bomb calorimeter, Boy's gas calorimeter, Numericals. Solid Fuel– Coal– Proximate and ultimate analysis. Numericals. Liquid fuels– Petroleum– Composition and refining. Octane number of petrol, Cetane number of Diesel, Power alcohol, Biodiesel.

Gaseous fuel– Composition, properties and applications of NG, CNG, LPG.

Combustion: Chemical reactions, calculations for air required. Numericals.

Fuel cells– Definition, Advantages and limitations, phosphoric acid fuel cell, polymer electrolyte membrane fuel cell.

(8Hrs.)

Unit 5: Chemistry of Hydrogen and carbon

Chemistry of Hydrogen: The element- isotopes- importance. Methods of preparation - 1) laboratory- from aqueous acid and alkali. 2) Industrial -steam reforming of methane and coke, electrolysis of water. 3) From solar energy (water splitting). Storage- chemical (sodium alanates), physical (carbon materials), difficulties in storage and transportation. Compounds of hydrogen, methods of preparation and applications- a)Molecular hydrides- hydrocarbons, silane , germane, ammonia. b) Saline hydrides- LiH, NaH. Applications of Hydrogen, Hydrogen as a future fuel.

Chemistry of Carbon: Position in periodic table, occurrence, isotopes. Allotropes (crystalline and amorphous) - occurrence, structure based on bonding and applications in detail.

(8Hrs.)

Unit 6: Corrosion Science

Introduction. Types of corrosion- Dry corrosion- mechanism, Pilling-bed worth rule. Wet corrosion- mechanism. Factors influencing corrosion- Nature of metal, Nature of environment. Methods of corrosion control: Pourbaix diagram, Cathodic and anodic protection, Use of inhibitors, Protective coatings: surface preparation, a) Metallic coatings: Types of coatings, methods of applications, (hot dipping, cladding, electroplating & cementation), Electro less coatings, b) Non-metallic coatings: chemical conversion coatings, powder coatings.

Text Books:

1. Engineering Chemistry by O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd..
2. A Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd.

Reference Books:

1. Engineering Chemistry, Wiley India Pvt. Ltd., First edition 2011.
2. Inorganic chemistry, 5e, by Shriver and Atkins, Oxford University Press.
3. Hydrogen fuel – production transport and storage, Ram Gupta, CRC Press.
4. Basic Concepts of Analytical Chemistry, 2e, by S. M. Khopkar, New Age International Publishers.

Term Work: Any eight experiments:

1. Determination of hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of dissociation constant of weak acid (acetic acid) using pH meter.
4. To determine maximum wavelength of absorption of CuSO4/ FeSO4, verify Beer's law and find unknown concentration in given sample.
5. Titration of mixture of weak acid and strong acid with strong base using conductometer.
6. Preparation of polystyrene and phenol-formaldehyde/urea-formaldehyde resin and its characterization.
7. Determination of molecular weight/radius of macromolecule polystyrene/polyvinylalcohol by viscosity measurements.
8. Proximate analysis of coal.
9. Preparation of nickel coating on copper metal using both methods, Electroplating & Electro less plating.
10. Determination of electrochemical equivalent (ECE) of copper.

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

Laboratory manual:

1. Vogel's Text book of Quantitative Chemical Analysis, 6e, by J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice, 2e, by O. P. Virmani and A. K. Narula, New Age International (P) Ltd.

University of Pune
First Year Engineering

110003: Fundamentals of Programming Languages -I

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

Examination Scheme
On-Line Exam: 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 basics of programming in C

Unit	Syllabus	Hrs
I	Introduction to Open Source Operating Systems and Programming Languages Introduction to Bharat Operating System (BOSS) GNU/Linux users model GUI, System Folders, study Commands (Using command terminal) with switches : ls, Directory Commands, Change user, privileges, passwords, tty, who, config, make, rpm, yum, sudo, Shutdown.	01
	Eclipse Editor, Compiler, Linker, Libraries, GUI, Configuring Programming Environments: C, C++. Java, Python (Pydev), Output, Debug windows	01
	Introduction to types of Programming Languages – Machine-level, Assembly-level and High-level Languages, Scripting Languages, Natural Languages; Their relative Advantages and Limitations. Characteristics of a Good Programming Language; Selecting a Language out of many available languages for coding an application; subprograms. Short Introduction to LISP, Simulation Platforms: MATLAB and GNU Octave(Open Source), Importance of Documentation, Documentation Platform LATEX (Free ware/Open Source).	02
II	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;	01
	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.	01

III	C Programming: 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;	03
IV	C Programming: 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 Post test Loops using "do...while" statement; Functions – Creating Subprograms using Functions; Parameter Passing by Value; Parameter Passing by Reference; Main Function with argv, argc[]. Definition of Testing & Debugging	03

	Text Books (Use Latest Editions)
1	Pradeep K. Sinha and Priti Sinha, "Computer Fundamentals: Fourth Edition", BPB Publications, 6th Edition, 2011.
2	Behrouz A. Forouzan, Richard F. Gilberg, "COMPUTER SCIENCE – A Structured Programming approach using C", Indian Edition, Thomson, 3rd edition
3	Eclipse Step By Step by Joe Pluta ISBN 1-58347-044-1
4	Moving From Windows to Linux by Chuck Easttom ISBN-13: 978-1584504429

Reference Books (Use Latest Editions)

1. Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India
2. Carlo Ghezi, Mehdi Jazayeri, "Programming Language Concepts", John Wiley and Sons
3. E. Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill
4. Yashavant Kanetkar, "Let Us C" – Seventh Edition, BPB Publications
5. CDAC: BOSS GNU/Linux User's Manual

Term Work:

	Laboratory Assignments	**Hrs**
	Group A: Essential Prerequisites (Compulsory)	
1.	Use and Study of Linux GUI and Commands	1
2.	Handling and Use of Eclipse Editor for Creating Projects in C, Python (Pydev), Java.	1
3.	Using Eclipse to write/test "Hello! World" Program in C, Python	2
	Group B: Foundation Programming in C (At least 8)	

4.	Write a C program to accept five numbers from console and then to display them back on console in ascending order.	1
5.	Write a C program to calculate the sum of all numbers from 0 to 100 (both inclusive) that are divisible by 4.	1
6.	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.	1
7.	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.	2
8.	Write a class to convert Character String of Lowercase to Uppercase & Numeric digits in reverse order.	2
9.	Write a program in C to read an integer and display each of the digit of the integer in English.	1
10.	Write a program in C to generate first 20 Fibonacci numbers	1
11.	Write a program in C to generate prime numbers between 1 and n.	1
12.	Write a program in C to compute the GCD of the given two integers	1
13.	Write a program in C to compute the factorial of the given positive integer using recursive function.	1
14.	Write a program in C to compute the roots of a quadratic equation.	1
15.	Write a program in C to sort n integers using bubble sort.	2
16.	Write a program in C to compute addition/subtraction/multiplication of two matrices. Use functions to read, display and add/subtract/multiply the matrices.	2
17.	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.	2
18.	Find a sub-string in a string using LISP	2

	Group C: Simulations and Advanced Language Programming (At least One)	
19.	Write a program in MATLAB/OCTAVE to compute addition/ subtraction/ multiplication of two matrices. Use functions to read, display and add/ subtract/ multiply the matrices.	2
20.	Write a program in Eclipse - Python to generate prime numbers between 1 and n.	2

The Laboratory instructors are instructed to demonstrate students (at the beginning to each laboratory session) the experiment to be covered in the beginning 10 minutes of every laboratory session. Prepare Laboratory manual using LATEX. Necessary Manuals, API, Help files must be available in the laboratory as ready-Reference to the students. Each experiment must be timely submitted and teachers are required to give practical learning to the students by asking them Home Work to prepare laboratory wall charts/ Note-book exercises regarding:

Forms of Documentation – Comments, System Manual, User Manual; Documentation Standards and Notations. Difference between Testing and Debugging; Types of Program Errors; Debugging a Program for Syntax Errors; Debugging a Program for Logic Errors, Concept of APIs/Libraries, Documentation using Latex .

UNIVERSITY OF PUNE

BASIC ELECTRICAL ENGEERING (103004)

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

Examination scheme
Paper - 50 Marks (2Hrs.)
Online – 50 Marks
Term work - 25 Marks

Unit 1. Elementary Concepts :
Prerequisite : Concepts of emf, potential difference, current and resistance.
Ohm's law, 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.

(6 Hrs)

Unit 2. 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.

(3Hrs)

Faraday's laws of electromagnetic induction, Fleming's right hand rule, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of coupling, energy stored in magnetic field.

(3Hrs)

Unit 3. Single phase Transformers and Electrostatics :

A) 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.

(3Hrs)

B) Electrostatics : Electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance. Capacitor, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors (no derivation) and time constant.

(3 Hrs)

Unit 4. AC fundamentals :

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

(4 Hrs)

Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage-current phasor diagrams, voltage-current and power waveforms.

(2 Hrs)

Unit 5. Single phase A.C. Circuits and Polyphase A. C. Circuits :

A) Single phase A.C. Circuits : Study of series and parallel R-L, R-C, R-L-C circuits, concept of impedance, admittance in case of above combinations, wave form and relevant voltage-current phasor diagrams, concept of active, reactive, apparent, complex power and power factor, resonance in series RLC circuit.

(4 Hrs)

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

(2 Hrs)

Unit 6. D. C. Circuits:

Classification of electrical networks. Kirchhoff's laws and their applications for network solutions using loop analysis. Simplifications of networks using series and parallel combinations and star-delta conversions. Energy sources - ideal and practical voltage and current sources. Superposition theorem, Thevenin's theorem.

(6 Hrs)

Term work :

The term work shall consist of a 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, fuses, 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) and Light Emitting Diode (LED) lamps.
   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 - a) Kirchhoff's laws and b) Superposition theorem.
6. Verification of Thevenin's theorem.
7. Study of R- L- C series resonance circuit.
8. Verification of voltage and current relations in three phase balanced star and delta connected loads.
9. Determination of performance of single phase transformer by direct loading for
   a) Voltage and current ratios and b) Efficiency and regulation.

Text Books:

1. Principles of Electrical Engineering by Del. Toro, PHI Learning Pvt. Ltd.
2. Theory and Problems of Basic Electrical Engineering- I.J.Nagrath and Kothari, PHI Learning Pvt. Ltd.
3. Basic Electrical Engineering, V.K.Mehta, S.Chand and Company Ltd., New Delhi.

Reference Books:

1. Electrical Technology- H.Cotton, C.B.S. Publications.
2. A Textbook of Electrical Technology: Volume- I – B.L.Theraja, S.Chand and Company Ltd., New Delhi.
3. Basic Electrical & Electronics Engg. By S K Bhattacharya, Pearson.
4. Basic Electrical Engineering. By D. C. Kulshreshtha, Tata McGraw Hill.
5. Electrical Technology - Edward Hughes, Pearson.

BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES:-

At the end of this course the student will be able to-

1. Understand and demonstrate the fundamentals of electromagnetism, single phase transformers, electrostatics, and A.C. and D.C. circuits.
2. Apply concept of electromagnetism for the working of transformer.
3. Differentiate between electrical and magnetic circuits.
4. Compare between D.C and A.C circuits.
5. Draw the phasor diagrams for single phase and three phase A.C circuits.
6. Provide solution for the network by applying various laws and theorems.
7. Obtain solutions for electrical networks analytically and verify these results experimentally in laboratory.
8. Demonstrate the awareness on social issues like conservation of electrical energy, electrical safety etc.
9. Develop abilities to excel in competitive exams required for post graduation and research.

104012: BASIC ELECTRONICS ENGINEERING

Teaching Scheme:

Lectures: 3 Hrs/Week Practical: 2 Hrs/Week

Examination Scheme:

Online Exam 1:	24 Marks
Online Exam 2:	26 Marks
Paper:	50 Marks
Term work	25 Marks

Course objectives:

This course is designed to give exposure and knowledge of basic Electronic components and circuits to the First Year Engineering of all branches. The course begins with introduction of basic diodes and transistor based circuits, to the OP-AMP based simple linear applications, power supply ICs, Digital logic circuit and concludes with introduction to Industrial Electronics and Electronic communication.

1) To give knowledge of some basic electronic components and circuits.
2) To introduce basics of diode and transistor circuits.
3) To understand working of some IC based circuits.
4) To study logic gates and their usage in digital circuits.
5) To expose the students to working of some power electronic devices, transducers and application of transducers.
6) To introduce basic aspect of electronic communication systems.
7) The associated Laboratory Practical course is designed to understand working of various Electronic circuits. The students will understand how to use the basic test and measuring instruments to test the circuits.

Topics:

Unit I : Diode Circuits **[6L]**

Half wave rectifiers, Full wave rectifiers, Power supply filters and Capacitor filters, Diode limiting (Clippers) and Clamping circuits, Voltage multipliers, Zener diode & its applications, LEDs and Photodiodes.

Unit II : Bipolar Junction Transistor (BJT) Circuits **[6L]**

BJT Structure & its operation with normal biasing, Transistor characteristics and parameters, DC operating point, Transistor as an amplifier, Transistor as a switch, Enhancement-type MOSFET

Unit III: Linear Integrated Circuits **[6L]**

Introduction to operational amplifiers, Op-amp input modes and parameters, Negative feedback, Op-amp with negative feedback, Comparators, Summing amplifiers, Integrators and

Differentiators, IC 555 timer as an oscillator, Voltage regulation, IC voltage regulators (Three pin).

Unit IV: Digital Electronics **[6L]**

Introduction, Digital signals, Basic digital circuits-AND, OR, NOT, NAND, NOR, EX-OR, Boolean algebra, Examples of IC gates, Standard representation for logic functions, Half adder, Full adder, Multiplexers, De-multiplexer, Flip-flops, 1-bit memory cell, D flip-flop, Shift registers, Counters, Block diagram of Microprocessor and Microcontroller and their applications.

Unit V: Power devices and Transducers **[7L]**

Power Devices: Basics of 4-layer devices: Silicon Controlled Rectifier (SCR), Diac and Triac.
Transducers: Introduction, Electrical transducer, Selecting a transducer, Resistive transducer, Thermistor, Inductive transducer, Linear Variable Differential Transducer (LVDT), Load cell, Phototransistor, Temperature transducers, Flow measurement (Mechanical transducers) Application of transducers: Digital Thermometer, Weighing machine(Block diagrams).

Unit VI: Electronic Communication **[7L]**

Importance of Communication System, The elements of a Communication System, Bandwidth requirement, IEEE frequency spectrum, Transmission media: Wired (Twisted pair, Coaxial & Optical fiber Cables) and Wireless, Need for modulation, Analog modulation schemes- AM & FM, Mobile communication system: Cellular concept, Simple block diagram of GSM system.

Text Books:

1) Floyd, "Electronic Devices & Circuits", Pearson Education India. (For Unit I, II, III)
2) R.P. Jain, "Modern digital electronics", 3rd edition, 12th reprint TMH Publication, 2007.(For Unit IV)
3) H. S. Kalasi "Electronic Instrumentation", Tata McGraw Hill. (For Unit V)
4) Frenzel, "Communication Electronics-Principles & Applications", TATA McGraw Hill.(For Unit VI)

Reference Books:

1) Jacob Milman, C C Halkias, Chetan Parikh, "Integrated Electronics", Tata McGraw Hill
2) Paul Horowitz, Winfield Hill, "Art of Electronics", Cambridge Univ Press, Low Price Edition
3) Debashish De, Kamakhya Prasad Ghatak, "Basic Electronics", Pearson Education.
4) J R Cogdell, "Foundations of Electronics", Pearson Education.
5) Santiram Kal,"Basic Electronics, Devices, circuits and IT Fundamentals"

List of Practicals:

1) **Study of different electronic components.**
   a. Resistors (Carbon Film, Metal Film, Wire Wound, Variable),
   b. Capacitors (Electrolytic, Mica, Ceramic, Variable),
   c. Inductors, Transformers,
   d. Connectors, Switches
2) **Study of different electronic measuring instruments.**
   a. To study different controls of DMM and measurement of parameters like AC and DC voltage, current
   b. To study controls of CRO, Measurements of frequency, phase, AC & DC Voltages.
   c. To study various controls of a signal generator
3) **Study of Regulated power supply.**
   For a given Regulated Power Supply circuit with bridge Rectifier, capacitor filter and three terminal regulator:
   a. Identify pins of rectifier Diode (such as 1N4001) and study of its data sheet specifications.
   b. Identify pins of Three Pin Regulator (such as LM 78XX or LM 79XX) and study of its data sheet specifications.
   c. To measure voltages and observe waveforms at transformer secondary, output of Bridge Rectifier, output of Regulator.
4) **Study of Single stage BJT Common Emitter amplifier circuit.**
   For a given BJT CE Amplifier circuit
   a. Identify pins of a BJT (such as BC547) and study of its data sheet specifications.
   b. To measure voltages and observe waveforms at input and output terminals of single stage BJT Common Emitter amplifier circuit.
   c. Calculate voltage gain of the amplifier.
5) **Study of Op-amp based amplifiers circuits.**
   a. Identify pins of an Opamp (such as LM741)
   b. Implement given voltage equation for 2 inputs with Opamp based Summing and Difference amplifier (such as $Vo=2V_1+3V_2$ and $Vo=4V_1-V_2$)
6) **Study of IC 555 Timer circuit.**
   a. Identify pins of IC 555 Timer
   b. Observe output waveform and measure frequency of output wave for IC 555 Timer used in Astable mode.
7) **Study of Digital circuits.**
   a. Identify pins of Digital Logic Gates ICs such as AND, OR, NOT, Ex-OR, NAND
   b. Implement Half and Full Adder circuit with basic logic gate ICs
8) **Build and test Simple application circuit**
   Build & Test any circuit using IC such as Opamp LM741, IC 555 Timer, LM78XX/79XX or any digital logic gate IC.

101005 Basic Civil and Environmental Engineering

Teaching Scheme
Lectures: 03hours /week
Practicals: 02 hours /week

Examination Scheme
Online Exam. 50 marks
Theory Exam. 50 marks
Term work: 25 marks

Section I

Unit 1: Introduction to Civil Engineering (6 hours)
a) Basic Areas in Civil Engineering Surveying, Construction Engineering, Fluid Mechanics, Transportation Engineering, , Irrigation Engineering, Project Management ,Structural Engineering, Geotechnical and Foundation Engineering, Environmental Engineering, Quantity Surveying, Town Planning ,Earthquake Engineering, Infrastructure Development.
b) 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) basic materials for construction - cement, bricks, stone, natural and artificial sand, Reinforcing Steel- Mild, Tor and High Tensile Steel. Concrete types - PCC, RCC Prestressed and Precast. Recycling of materials.
b) *Substructure*- Definition and functions of Foundation, (Only concepts of settlement and Bearing capacity of soils.) Types of shallow foundations, Deep foundation (only concept of friction and end bearing pile).
c) *Superstructure* - Types of loads: - DL and LL, wind loads, earthquake considerations. Types of Construction-Load Bearing, Framed, Composite. Fundamental requirements of masonary.
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)
a) Principles of survey ,introduction to scale, types of maps and their uses.. Modern survey methods using levels, Theodolite, EDM, lasers, total station and GPS. Measuring areas from maps using digital planimeter.
b) 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 its application areas.

Section II

Unit 4: Ecology and Eco System (6 hours)
a) Concept of Environment - biotic and abiotic factors. Impact of the human behaviour and the technological advancements on the environment. Need for conserving natural resources and preserving the environment. Engineer's role in achieving sustainable development. Environmental Impact Assessment (only concept).
b) Introduction to solid waste management, electronic wastes and its disposal.

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

a) Concept of an integrated built environment-natural and manmade. Principles of planning, viz. Aspect, Prospect, Roominess, Grouping, Privacy, Circulation, Sanitation, Orientation, Economy.
b) Use of various eco-friendly materials in construction. Concept of green buildings.
c) Role of by-laws in regulating the environment, Concept of built up area, carpet area, plinth area. Plot area, FSI.

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
2. Water 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 term work.
1. Study of any 4 types of maps and writing their uses.
2. Exercise on use of dumpy level and laser level.
3. Measurement of area of irregular figures by digital planimeter.
4. Drawing of plan elevation & section for a residential building, single storeyed framed/load *bearing* structure. Preparing schedule of openings [On half imperial sheet.]
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 by Kanitkar, Kulkarni—Pune Vidyrthi Prakashan

2) Build Planning and Built Environment by Shah ,Kale, Patki—Tata Mc Graw Hill

3) Civil E ngg. Materials by Dr . S.V.Deodhar---Khanna Publications

Reference Books :

1)) Basic Civil Engineering by M.S..Palanichamy Tata Mc Graw Hill publishing Co.Ltd.N.D.

2) Basic Civil Engineering by Shatheesh Gopi---Pearson

3) Elements of Civil Engg. and Engg.Mech. by R.V.Raikar---PHI Learning Pvt Ltd.

102006 - Engineering Graphics – I

Teaching Scheme: Theory: 3 Lectures/Week Practical: 2 Hrs./Week

Examination Scheme:

Offline Test I	25 Marks	Duration: 1 Hr. ~~Units I & II~~
Offline Test II	25 Marks	Duration: 1 Hr. ~~Units III & IV~~
Theory Paper	50 Marks	Duration: 2 Hrs. ~~Units I to VI~~

Course Objective

1. *To develop imagination of Physical Objects to be represented on Paper for Engineering Communication.*
2. *To develop the manual drawing Skill, drawing interpretation Skill*
3. *To develop the physical realisation of the dimension of the objects*

UNIT: I **7 Hrs.**

Fundamentals of Engineering Drawing: Introduction to Drawing Instruments & their uses, Engineering Lettering, Drawing Sheet - Layout of drawing sheets, sizes of drawing sheets, Line - Types of lines and their applications in Mechanical Engineering Drawing, Dimensioning – Dimensioning terminology and method of execution, Placing of dimensions, General rules for dimensioning, Method of dimensioning: Linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Projections of Points and Lines: Theory of Projections (Reference Planes and Auxiliary Planes, First and Third Angle Method of projections), Projections of point only in First & Third quadrant with all possible positions.

Projections of lines: Projections of lines [by First Angle Method of projections only] inclined to horizontal plane, frontal plane and both i.e. oblique lines, on reference and auxiliary planes. True length of a line by rotation of view & rotation of plane methods, traces of lines [To locate only H.T. and V. T.]. *[Note: No application oriented questions].*

UNIT: II **6 Hrs.**

Projections of planes: Projections of planes on reference and auxiliary planes [by First Angle Method of projections only]. Projection of planes [Triangle – All Cases, Quadrilateral, Pentagon, Hexagon and Circle] by reference and auxiliary plane methods, Planes inclined to horizontal reference plane, frontal reference plane and oblique plane, True shape of a Plane, Angles made by the plane with Principle reference planes. *[Note: No combination of planes & no HT, VT of plane].*

UNIT: III **6 Hrs.**

Projection of Solids: Introduction to Solids, Types of Solids, Projections of Solids inclined to one & both reference plane, Projection of Solids (Tetrahedron, Cube, Prisms, Cylinder, Pyramid and Cone only with maximum six sided base). *[Note: No combination of solids & their frustums. Problems on solids resting on H.P. only].*

UNIT: IV **6 Hrs.**

Engineering Curves: Conic section – Ellipse, Parabola, Hyperbola by Focus-diretrix & rectangle method, Helix for Cylinder, Involute of a circle, Cycloid, Archemedian Spiral. *[Note: Construction of Tangent & Normal is not expected in Examination. Only Curves to be asked in Examination from Unit-IV].*

Development of Solids: Development of prism (Maximum six sides), Development of cone [*No combination of solids].*

UNIT: V **6 Hrs.**

Orthographic views: Orthographic projections of given pictorial view by First Angle Method of Projections only, Study of Types of sections, Sectional orthographic projections. *[Note: Only full sectional Orthographic view to be asked for Examination].*

UNIT: VI **6 Hrs.**

Isometric projections: Introduction to Isometric View with the example of Cube, Isometric axes, scale, Isometric projections and Isometric views, Construction of isometric, non-isometric Lines, Angles, Circles, Sphere, Arc etc. Drawing isometric views of simple solids and objects, Dimensioning - only Length, Width & Height of Isometric Views. *[Note: Only Isometric Views to be asked for Examination].*

Term Work

The following Five sheets to be drawn based on the above topics. All these sheets should be drawn on A2 size (594X420mm) (Half imperial) drawing sheets only.

1. Projections of lines / planes [Minimum Two Problems each]
2. Projections of solids [Minimum Two Problems]
3. Engineering Curves [Minimum Four Problems]
4. Development of Solids [Minimum Two Problems]
5. Orthographic projections [Minimum Two Problems]
6. Isometric projections [Minimum Two Problems]

Text Books

1. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujarat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw-hill Publishing Co. Ltd., New Delhi, India.
3. Basant Agrawal and C. M. Agrawal, Engineering Drawing, ata Mcgraw-hill Publishing Co. Ltd., New Delhi, India.
4. K. L. Narayana and P. L. Kannaiah, " Text Book on Engineering Drawing", Second Edition, Scitech Publications (India) Pvt. Ltd. Chennai, 2011.
5. K. C. John, "Engineering Graphics for Degree", PHI Learning Pvt. Ltd. New Delhi, 2009

Reference Books

1. W. J. Luzadder, Fundamentals of Engineering Drawing, Prentice Hall of India.
2. Basudeb Bhattacharyya, Machine Drawing Includes AutoCAD Supplements, Oxford University Press, India.
3. French and Vierck, Graphic Science, Mc-Graw Hill International.
4. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
5. R. K. Dhawan, A text book of Engineering Drawing, S. Chand and Company Ltd., New Delhi, India.
6. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
7. C. Jensen, J. D. Helsel and D. R. Short, "Engineering Drawing and Design", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012.
8. T. Jeyapoovan, "Engineering Drawing and Graphics using Auto CAD", Vikas Publication House Pvt. Ltd. New Delhi, 2011.

UNIVERSITY OF PUNE
First Year Engineering
107008 – Engineering Mathematics – II

Teaching Scheme:
Lectures – 4 Hrs./Week

Examination Scheme:
Paper – 50 Marks (2 Hrs.)
Online – 50 Marks

Course Objectives:

After completing this course student will have adequate background to understand the concepts of

1) Modeling of various physical systems such as Newton's Law of cooling, L-C-R circuits, rectilinear motion, mass-spring systems heat transfer etc.
2) Design and analysis of continuous and discrete system, where knowledge of Fourier series and Harmonic analysis is required.
3) Advanced techniques to evaluate integrals.
4) Measurement of arc lengths of various curves.
5) Sphere, cone and cylinder that arise in vector calculus, electro-magnetic field theory, cad-cam, computer graphics etc.
6) Multiple integrals which are used in calculating areas, volumes, mean and RMS values, mass, moment of inertia and centre of gravity.

Unit I **(09 Hrs.)**

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 II **(09 Hrs.)**

Application of DE: Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat, Chemical problems.

Unit III **(09 Hrs.)**

Fourier Series: Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.
Integral Calculus: Reduction formulae, Beta and Gamma functions.

Unit IV **(09 Hrs.)**

Integral Calculus: Differentiation Under the Integral Sign, Error functions.
Curve Tracing: Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

Unit V **(09 Hrs.)**

Solid Geometry: Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

Unit VI **(09 Hrs.)**

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:

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

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
2. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
3. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

University of Pune
First Year Engineering
110010: Fundamentals of Programming Languages-II

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

Examination Scheme
On-Line : 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 foundation programming in embedded C, Advanced Programming

Unit	Syllabus	Hrs
I	Microprocessors and Micro-Controllers Architectures and Programming Concepts	03
	Introduction to functional block diagram of 80386DX, Concepts of Machine Cycles, Memory types: Primary, Secondary, Cache, Concept of Segmentation and Paging, Processing of Interrupts and Exceptions. PIC Micro-controller systems Architecture Block diagram, SFR basics, Data and Program Memory, Programming I/O Interfaces using LED interfacing, Stepper-motor (Programmers Model/Block Diagram).	
II	Introduction to Advanced Programming Platforms	05
	Eclipse Programming Platform, C, C++, JAVA, Structured Files, File Handling operations, Linked Lists: Unidirectional, Bi-Directional and Circular, Data and Value Pointers basics, Trees, Basic Introduction to JVM, Basic Classes, Signals, Event Methods and Function, File Classes using case study of Calculator Program, Basics of Web Technology Programming using HTML for Hello! World Program, Display images, web links.	
III	Introduction to Embedded Programming Concepts	03
	Introduction to Embedded C, Introduction to C peripheral Interfaces, C Mechatronics Applications	
IV	Handheld Device Open Source Operating System Installations and Applications	01
	Overview of Android OS, Wireless Application Protocol(WAP), Open Handset Alliance, Android Platform Differences, Android Platform Basic Introduction to Android Development Environment: Configuring Development Environment, Exploring the Android SDK, Documentation, Framework, Android Tools, Sample Applications.	

	Emulator, Building, debugging and Running Android Applications	
	Text Books	
1.	Programming 8-bit PIC Micro-controllers in C, Martin P Bates. Newnes Elsevier. ISBN: 978-0-7506-8960-1	
2.	Learning Java by Patrick Niemeyer, Jonathan Knudsen, O'Reilly Media	
3.	Android Wireless Application Development: Developers Library. by Lauren Darcey and Shane Conder, Second Edition, Addison Wesly, ISBN-10: 0-321-74301-6	

	Laboratory Assignments:	**Hrs.**
	Groups A Assignments: (At least Two)	
1.	Use and Study of Linux GUI and Commands	1
2.	Write a program in (Eclipse) C++ to Display String "Hello! World"	1
3.	Write a program in (Eclipse) Java to Display String "Hello! World"	1
4	Web Technology Programming using HTML for Hello! World Program. Display images, web links.	1
	Groups B Assignments: (At least Six)	
5.	Write a class in C++/Java to add integer numbers	1
6.	Write a Java class for Binary Search	1
7.	Write a Java class for finding Palindrome	2
8.	Write Java/C++ program for Calculator Addition, Subtraction, Multiplication, Division.	2
9.	Write a C++ Class for sorting Numbers in Ascending/Descending Order.	2
10.	Write a class to convert string into chars & chars to string.	2
11.	Write a class for sine, cosine wave by mathematical formula.	2
12.	Write a Class for implementing Simple Calculator.	2
13.	Write a class to implement a Cross and Zero Game	2
14.	Finding the minimum spanning tree from a Tree.	2
15.	Write a Class to implement a Circular list.	1
16.	Write a class for showing the current Time. Date.	1
17.	Write a class to implement various Boolean Algebra Functions (At least 4 functions)	2
18.	Write a class to generate Gray Codes from Decimal Numbers	2
	Groups C Assignments: (At least Two)	

19.	Write a Embedded C program to switch-on/Switch-off LED (Programmers model)	3
20.	Write a Embedded C program to generate half angle bit sequence for stepper motor (Programmers model)	3
21.	Installation of Android ADT for Eclipse	3
22.	Study and implementation on Android Simulator, "Hello! World"	3

The Laboratory instructors are instructed to demonstrate students (at the beginning to each laboratory session) the experiment to be covered in the beginning 10 minutes of every laboratory session. Prepare Laboratory manual using LATEX. Necessary Manuals, API, Help files must be available in the laboratory as ready-Reference to the students. Each experiment must be timely submitted and teachers are required to give practical learning to the students by asking them Home Work to prepare laboratory wall charts/ Note-book exercises regarding:
Programmable I/O Peripherals 8255, 80386Dx Memory MAP, Paging address generation, Current characteristics Diagram of Stepper motor Driver Circuit, Booting of Linux, gcc Switchs, Developing the local *index.html* page in HTML system folder, Documentation using Latex.

Engineering Mechanics (101011)

Teaching Scheme
Lectures: 04 hours /week
Practicals: 02 hours /week

Examination Scheme
Online Exam. 50 marks
Theory Exam. 50 marks
Term work: 25 marks

Unit: I (6 hours)

a) Principle of statics, force systems, resolution and composition of forces. Resultant of concurrent forces. Moment of a force, Varignon's theorem, resultant of parallel force system. Couple, Equivalent force couple system.

b) Resultant of general force system. Distributed forces. Centroid of plane lamina and wire bends.

Unit II (7 hours)

a) Kinematics- Basic concepts, equations of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves. Relative motion and dependant motion.

b) Kinetics- Newton's second law of motion and its application.

Unit III (7 hours)

a) Kinematics: basic concepts, equation of motion in Cartesian co-ordinates. Path and polar co-ordinates. Motion of projectiles.

b) Kinetics: Newton's second law of motion in Cartesian and Path co-ordinates for curvilinear motion of a particle.

Unit IV (6 hours)

a) Work, power, energy, conservative and non-conservative forces. Conservation of energy and work energy principle for motion of particle.

b) Impulse, momentum, directs central impact and coefficient of restitution. Conservation of momentum and Impulse momentum principle of particle.

Unit: V (7 hours)

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 of concurrent and parallel forces in a space. Equilibrium of concurrent and parallel forces in a Space.

Unit VI (7 hours)

a) Two force members: analysis of plane trusses by method of joint and method of section, cables subjected to point loads. Multi force member: plane frames.

b) Friction: law's of friction, application of friction on inclined plane. Wedges and ladders friction, application to flat belt.

Text Books

1)Vector Mechanics for Engineers by Beer & Johnston---Mc Graw Hill

2) Engg. Mechanics :S.Timosenko,Dtp.Young and J.V.Rao.--- Tata Mc Graw Hill Education Pvt Ltd .New Delhi

3)Engg. Mechanics by Basudeb Bhattacharyya----- Oxford University Press,

Reference Books

1) Engg. Mechanics by I.H.Shames & G.K.M.Rao.--- Pearson

2)Fundamentals of Engg. Mechanics by S.Rajasekaran & G. Sankarsubramanian : Vikas Publishing House Pvt.Ltd.

3)Engg. Mechanics by K.L.Kumar & Veenu Kumar. Tata Mc Graw Hill Education pvt Ltd .New Delhi

4)Engg. Mechanics bySoutas,Little,Inman-----India Edition—Cengage Learning

102013 - Basic mechanical Engineering

Teaching Scheme: Theory: 3 Lectures/Week Practical: 2 Hrs./Week Term Work: 25 Marks

Examination Scheme:

On-line Test I	25 Marks	Duration: 30 Minutes. Units I & II
On-line Test II	25 Marks	Duration: 30 Minutes Units III & IV
Theory Paper	50 Marks	Duration: 2 Hrs. Units I - VI

Course Objectives:

- This course will help the student to acquire knowledge of mechanical engineering.
- Describe the scope of mechanical engineering with multidisciplinary industries.
- Understand and identify common machine elements with their functions and power transmission devices.
- Learn conventional machine tools and understand the concept of design in mechanical engineering.
- Impart knowledge of basic concepts of thermodynamics applied to industrial applications.
- Understand laying principles of energy conversion systems and power plants.

Unit 1: Introduction to Mechanical Engineering **6 Hrs.**

Mechanical Elements:- Function, Sketch, Description, Uses of- Shaft, Axle, Key (Parallel key), Coupling (Rigid Flanged Coupling), Bearing-(Ball bearing), Clutch- Single Plate Clutch, Brake - Disc Brake.

Power Transmission Devices: Construction, working, comparison & applications of: Belt Drive (Flat and V Belt), Chain Drive and Spur Gear Drive arranged with simple gear train.

Unit 2: Design Fundamentals **6 Hrs.**

Design: Steps in design process, Mechanical Properties (Strength, Toughness, Hardness, Ductility, Malleability, Brittleness, Elasticity, Plasticity, Resilience, Fatigue, Creep) and selection of Engineering materials, Applications of following materials in engineering -Aluminium, Plastic, Steel, Brass, Cast Iron, Copper, Rubber

Mechanism (Descriptive treatment only): Definition and comparison of Mechanism and Machine, Four Bar Mechanism, Slider Crank Mechanism.

Unit 3: Manufacturing Processes **6 Hrs.**

Introduction to Manufacturing Processes and their Applications (Casting, Forging, Sheet metal working and Metal joining processes), Description of the Casting process: Sand casting (Cope & Drag), Sheet metal Forming (shearing, bending, drawing), Forging (Hot working and cold working comparison), Electric Arc welding, Comparison of – Welding, Soldering, Brazing.

Unit 4: Machine Tools **6 Hrs.**

Basic Elements, Working Principle, Types of Operations with block diagram: Lathe Machine - Centre Lathe, Drilling Machines, Grinding Machines.

Unit 5: Thermal Engineering **6 Hrs.**

Thermodynamics: Thermodynamics system (open, close, isolated), Thermodynamic Properties: Definition and Units of –Temperature, Pressure (atmospheric, absolute and gauge), Volume, Internal energy, Enthalpy, Concept of Mechanical work, , Thermodynamics Laws with example- Zeroth Law, First Law, Limitations of

first law, Concept of heat Sink, Source, heat engine, heat pump, refrigeration engine, 2nd Law of thermodynamics statements (Kelvin Plank, Claussius), Numerical on 2nd law only.

Measurement: Measurement of Temperature (Thermocouple – Type according to temperature range and application), Measurement of Pressure (Barometer, Bourdon pressure gauge, Simple U tube Manometer with numerical).

Unit 6: Applied Thermal Engineering **6 Hrs.**

Power Plant Engineering: Conventional and non-conventional energy resources, Hydro-electric, Thermal, Nuclear, Wind, Solar [with Block diagram].

Power Producing Devices: Boiler - Water tube and fire tube, Internal combustion engine – Two stroke and four stroke (Spark ignition and compression ignition), Turbines – Impulse and reaction.

Power Absorbing Devices: Pump – Reciprocating and Centrifugal, Compressor – Single acting, single stage reciprocating air compressor, Refrigeration – Vapour compression refrigeration process, House hold refrigerator, Window air conditioner (Working with block diagrams).

Term Work

Term work shall consist of the following:

1. Study of power transmitting elements: couplings, gears and bearings.
2. Study of mechanisms: four bar mechanism, slider crank mechanism
3. Study, demonstration and working of centre lathe machine
4. Study of any one power plant
5. Study, demonstration on two stroke and four stroke engine.
6. Study, domestic refrigerator and window air conditioner.
7. Study of Package Type Boiler.
8. Report on visit or guest lecture related to mechanical engineering.

Text Books:

1. G. Shanmugam, S. Ravindran, "Basic Mechanical Engineering", Tata McGraw-Hill Publisher Co. Ltd.
2. R. K. Purohit, "Foundation of Mechanical Engineering", Scientific Publishers.
3. C. S. Chetankumar, B. P. Mahesh, "Elements of Mechanical Engineering", S. Chand Publications.
4. P. K. Nag, "Engineering Thermodynamics", Tata McGraw-Hill Publishing Co. Ltd.
5. Chaudhari, Hajra, "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers, Mumbai.

Reference books:

1. P. K Nag "Thermodynamics", Tata McGraw-Hill Publishing Co. Ltd
2. V. B. Bhandari "Design of Machine Elements" Tata McGraw-Hill Publishing Co. Ltd
3. S. S. Ratan, "Theory of Machine" Tata McGraw-Hill Publishing Co. Ltd
4. Yunus A. Cengel and Boles, " Thermodynamics ",Tata McGraw-Hill Publishing Co. Ltd
5. Arora and Domkunwar, "Thermal Engineering", Dhanpat Rai and Sons.
6. Surinder Kumar, "Basics of Mechanical Engineering", Ane Books Pvt. Ltd., New Delhi. 2011
7. T. J. Parbhu, V. Jaiganesh and S. Jebaraj, "Basic Mechanical Enigeering", Scitech Publications (India) Pvt. Ltd. Chennai, 2010.

102014 - Engineering Graphics – II

Practical: 2 Hrs./Week **Term Work:** 50 Marks

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

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

1. Projections of solids [Minimum Two Problems]
2. Engineering Curves [Minimum Two Problems]
3. Development of Solids [Minimum Two Problems]
4. Orthographic projections [Minimum Two Problems]
5. Isometric projections [Minimum Two Problems]

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.

Text Books

1. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujarat, India.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Mcgraw-hill Publishing Co. Ltd., New Delhi, India.
3. Basant Agrawal and C. M. Agrawal, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd., New Delhi, India.
4. K. L. Narayana and P. L. Kannaiah, " Text Book on Engineering Drawing", Second Edition, Scitech Publications (India) Pvt. Ltd. Chennai, 2011.
5. K. C. John, "Engineering Graphics for Degree", PHI Learning Pvt. Ltd. New Delhi, 2009

Reference Books

1. Basudeb Bhattacharyya, Machine Drawing Includes AutoCAD Supplements, Oxford University Press, New Delhi, India.
2. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
3. Basudeb Bhattacharyya, Machine Drawing Includes AutoCAD Supplements, Oxford University Press, New Delhi, India.
4. R. K. Dhawan, A text book of Engineering Drawing, S. Chand and Company Ltd., New Delhi, India.
5. N. B. Shaha and B. C. Rana, Engineering Drawing, Pearson Education.
6. T. Jeyapoovan, "Engineering Drawing and Graphics using Auto CAD", Vikas Publication House Pvt. Ltd. New Delhi, 2011.

Board of Studies in Production/Industrial Engineering
University of Pune

FE – All Branches
Workshop Practices

Teaching Scheme
Scheme
Practical: 2 hrs/week

Examination
Marks
Term work: 50

Objective :
Introduction to different materials in engineering practices with respect to their workability, formability & machinability with hand tools & power tools and to develop skills through hands on experience.

I. Any Two Utility Jobs

(a) Carpentry - 1 Job
Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work to include one job involving joint and woodturning.

(b) Fitting - 1 Job
Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

(c) Sheet Metal Practice – 1 Job
Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.
Term work to include a utility job in sheet metal.

(d) Joining – 1 Job
Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

II. Broad Guidelines for demonstrations [any four]
Each demonstration will be of 2 hours duration.

(a) Assembly and Inspection
Assembly and Disassembly of some products, tools used. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments. Introduction to measuring equipments used in Quality Control

(b) Safety in Workshop

Fire hazards, electric short circuit –causes and remedies, Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

(c) Forging

Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

(d) Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

(e) Plumbing

Types of pipe joints, threading dies, Pipe fittings.

(f) PCB Making

Layout drawing, positive & negative film making, PCB etching and drilling.

(g) Machine Tools

Turning, Milling, Grinding, Shaping, Planning - machines, Tools & Accessories.

Note:

All demonstrations to be engaged by teaching faculty and corresponding teaching load be shown in the time table for respective teaching faculty.

III. Submissions:

1) Two jobs as mentioned above.
2) Brief write-up with illustration/sketches on the demonstrations (not more than 3 pages for each demonstration)

Text Book:

Chaudhas, Hazra, "Elements of Workshop Technology", Volume I&II, Media Promoters & Publishers, Mumbai