Teaching and Evaluation Scheme for
First Year of B.E. /B. Tech. (Chemical/Mechanical/Civil/Petrochemical) or Group A programs in an Institute

Semester I

Sr. No.	Course Code	Name of the Course	Teaching Scheme			Evaluation Scheme			Credit
			L	T	P	IA	MSE	ESE	
1	MATH101	Engineering Mathematics-I	3	1	0	20	20	60	4
2	HS102	Communication Skills	3	0	0	20	20	60	3
3	PHY103	Engineering Physics	3	1	0	20	20	60	4
4	ME104	Engineering Graphics	2	0	0	20	20	60	2
5	CV105	Basic Civil Engineering	3	0	0	20	20	60	3
6	CHE106	Energy and Environment Engineering	2	0	0	20	20	60	2
7	HS102L	Communication Skills Laboratory	0	0	2	60	0	40	1
8	PHY103L	Engineering Physics Laboratory	0	0	2	60	0	40	1
9	ME104L	Engineering Graphics Laboratory	0	0	4	60	0	40	2
10	CV105L	Basic Civil Engineering Laboratory	0	0	2	60	0	40	1
11	WS100L	Workshop Practices	0	0	4	60	0	40	2
		Total							**25**

Semester II

Sr. No.	Course Code	Name of the Course	Teaching Scheme			Evaluation Scheme			Credit
			L	T	P	IA	MSE	ESE	
1	MATH201	Engineering Mathematics-II	3	1	0	20	20	60	4
2	ME202	Engineering Mechanics	3	0	0	20	20	60	3
3	CHM203	Engineering Chemistry	3	1	0	20	20	60	4
4	EE204	Basic Electrical Engineering	3	0	0	20	20	60	3
5	EXE205	Basic Electronics Engineering	3	0	0	20	20	60	3
6	ICT206	Basic Computer Programming	3	0	0	20	20	60	3
7	ME202L	Engineering Mechanics Laboratory	0	0	2	60	0	40	1
8.	CHM203L	Engineering Chemistry Laboratory	0	0	2	60	0	40	1
9	EE204L	Basic Electrical Engineering Laboratory	0	0	2	60	0	40	1
10	EXE205L	Basic Electronics Engineering Laboratory	0	0	2	60	0	40	1
11	ICT206L	Basic Computer Programming Laboratory	0	0	2	60	0	40	1
		Total							**25**

Teaching and Evaluation Scheme for
First Year of B. E. /B. Tech. (Electrical/Electronics/Computer/IT) or
Group B programs in an Institute
Semester I

Sr. No.	Course Code	Name of the course	Teaching Scheme			Evaluation Scheme			Credit
			L	T	P	IA	MSE	ESE	
1	MATH101	Engineering Mathematics-I	3	1	0	20	20	60	4
2	ME102	Engineering Mechanics	3	0	0	20	20	60	3
3	CHM103	Engineering Chemistry	3	1	0	20	20	60	4
4	EE104	Basic Electrical Engineering	3	0	0	20	20	60	3
5	EXE105	Basic Electronics Engineering	3	0	0	20	20	60	3
6	ICT106	Basic Computer Programming	3	0	0	20	20	60	3
7	ME102L	Engineering Mechanics Laboratory	0	0	2	60	0	40	1
8	CHM103L	Engineering Chemistry Laboratory	0	0	2	60	0	40	1
9	EE104L	Basic Electrical Engineering Laboratory	0	0	2	60	0	40	1
10	EXE105L	Basic Electronics Engineering Laboratory	0	0	2	60	0	40	1
11	ICT106L	Basic Computer Programming Laboratory	0	0	2	60	0	40	1
		Total							**25**

Semester II

Sr. No	Course Code	Name of the course	Teaching Scheme			Evaluation Scheme			Credit
			L	T	P	IA	MSE	ESE	
1	MATH201	Engineering Mathematics-II	3	1	0	20	20	60	4
2	HS202	Communication Skills	3	0	0	20	20	60	3
3	PHY203	Engineering Physics	3	1	0	20	20	60	4
4	ME204	Engineering Graphics	2	0	0	20	20	60	2
5	CV205	Basic Civil Engineering	3	0	0	20	20	60	3
6	CHE206	Energy and Environment Engineering	2	0	0	20	20	60	2
7	HS202L	Communication Skills Laboratory	0	0	2	60	0	40	1
8	PHY203L	Engineering Physics Laboratory	0	0	2	60	0	40	1
9	ME204L	Engineering Graphics Laboratory	0	0	4	60	0	40	2
10	CV205L	Basic Civil Engineering Laboratory	0	0	2	60	0	40	1
11	WS200L	Workshop Practices	0	0	4	60	0	40	2
		Total							**25**

[MATH101] Engineering Mathematics – I

Teaching Scheme:
Lecture: 3 hrs/week
Tutorial: 1 hr/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   6 hrs
Linear Algebra - Matrices: Elementary row and column transformations on a matrix; Rank of a matrix-normal form; Inverse of a matrix by using elementary transformations; Consistency and solutions of systems of linear equations using elementary transformations; Eigen values and eigen vectors; Properties of eigen values and eigen vectors; Cayley-Hamilton's theorem (without proof) and its applications.

Unit 2   6 hrs
Differential Calculus and Its Applications: Successive differentiation – standard results; Leibnitz's theorem; Expansions of functions: Maclaurin's series, Taylor's series; Indeterminate forms.

Unit 3   6 hrs
Partial Differentiation: Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem; Total derivative; Change of variables.

Unit 4   6 hrs
Applications of Partial differentiations: Jacobians - properties; Taylor's theorem for functions of two variables; Errors and approximations; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.

Unit 5   6 hrs
Multiple Integrals and Their Applications: Double integrals and their evaluation; Change of order for integration; Double integrals in polar coordinates; Triple integrals; Application of multiple integrals to find area, volume, surface area, moment of inertia and centre of gravity.

Unit 6   6 hrs
Infinite Series: Definition of an infinite series; Types of infinite series-convergent, divergent and oscillatory; Positive term series-Comparison test, Integral test, D'Alembert's ratio test, Raabe's test, Logarithmic test, Cauchy's Root test; Alternating series-Leibnitz's rule; Absolute and conditional convergence; Power series–interval of convergence.

Reference/Text Books:
1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers.
2. P. N. Wartikar & J. N. Wartikar, *A Text Book of Applied Mathematics (Vol I & II)*, Pune Vidyarthi Griha Prakashan, Pune.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons.
4. Dr. B. B. Singh, *A course in Engineering Mathematics (Vol I & II)*, Synergy Knowledge-ware, Mumbai.
5. B. V. Ramana, *Higher Engineering Mathematics*, McGraw-Hill Publications, New Delhi.
6. N. P. Bali, *A Text Book of Engineering Mathematics*, Laxmi Publications, New Delhi.
7. Peter O' Neil, *A Text Book of Engineering Mathematics*, Thomson Asia Pvt. Ltd., Singapore.

8. C. R. Wylie & L. C. Barrett, *Advanced Engineering Mathematics,* McGraw Hill Publishing Company Ltd.

[HS102/HS202] Communication Skills

Teaching Scheme:
Lecture: 3 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   4 hrs

Communication and Communication Processes: Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Verbal and Non-verbal Communication, ways of Effective Communication.

Unit 2   5 hrs

Oral Communication: Use of Language in Spoken Communication, Features of Good Communication, Principles and Practice of Group Discussion, Public Speaking (Addressing Small Groups and Making Presentation), Interview Techniques, Appropriate Use of Non-verbal Communication, Presentation Skills, Telephonic Etiquettes, Extempore, Elocution, Describing Experiences and Events.

Unit 3   4 hrs

Study of Sounds in English: Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English, Stress Mark.

Unit 4   11 hrs

English Grammar
Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Synonyms and Antonyms, Common Errors, Sentence Formation and Sentence Structures, Use of Appropriate Diction.

Unit 5   12 hrs

Writing Skills
Features of Good Language, Difference between Technical Style and Literary Style, Writing Emails, Formal and Informal English, Business Writing, Advertisements, Essay Writing, (Technical, Social, and Cultural Topics), Technical Reports: Report Writing: Format, Structure and Types, Writing Memorandum, Circulars, Notices, Agenda and Minutes, Technical Manuals, Brochures**.**
Letter Writing: Types, Parts, Layouts, Letters and Applications, Use of Different Expressions and Style, Writing Job Application Letter and Resume.

Unit 6   6 hrs

Reading Skills & Listening Skills
Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Fast Reading, Strategies for Reading, Comprehension**.**

Listening: Importance of Listening, Types of Listening, and Barriers to Listening.

Reference/Text Books:
1. Meenakshi Raman and Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2008.
2. M. Ashraf Rizvi, *Effective Technical Communication*, McGraw Hill Publication, 2005.
3. Golding S. R, *Common Errors in English Language*, Macmillan, 1978.

4. Christopher Turk, *Effective Speaking, E and FN Spon*, London, 1985.
5. Sanjay Kumar, Pushp Lata, *Communication Skills*, Oxford University Press, 2016.
6. Teri Kwal Gamble, Michael Gamble, *Communication Works*, McGraw Hill Education, 2010.

[PHY103/PHY203] Engineering Physics

Teaching Scheme:
Lecture: 3 hrs/week
Tutorial: 1 hr/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   **6 hrs**

Oscillation and Ultrasonic's:
Free oscillation, damped oscillation, Forced oscillation and resonance, differential wave equation, Ultrasonic waves, Piezoelectric and Magnetostriction effect, and production of ultrasonic waves and its application.

Unit 2   **10 hrs**

Optics, Fibre Optics Laser:
Interference of light in thin film, wedge shaped film , Newton's rings, polarization of light, methods for production of polarized light, Huygen's theory of double refraction, Laurent's half shade Polarimeter, Principle of laser, Spontaneous and stimulated emission (Einstein's coefficients), Types of laser – Ruby and He-Ne laser and its applications. Principle, structure of optical fibre, acceptance angle, acceptance cone, numerical aperture, types of optical fibre and its application.

Unit 3   **7 hrs**

Electron Optics, Nuclear Physics and Quantum Mechanics:
Motion of a charged particle in electric and magnetic field, measurement of e/m by Thomson's method, Millikan's oil drop method, Bainbridge mass spectrograph, Q- value of nuclear reactions, G.M. counter, Davisson and Germer's electron diffraction experiment, Heisenberg's uncertainty principle, Schrodinger's time dependent and time independent wave equation, physical significance of wave function.

Unit 4   **6 hrs**

Crystal Structure and X-rays:
Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, X-ray, Bragg' law, Mosley's law.

Unit 5   **6 hrs**

Magnetic, and Superconducting Materials:
Magnetic dipole moment, Types of magnetic materials, B-H curve, Classical free electron theory-electrical conductivity, resistivity and its temperature dependence, microscopic Ohm's law, Superconductivity, types of superconductors, Meissner effect and Applications.

Unit 6   **6 hrs**

Semiconducting, Dielectrics and Electrodynamics:
Band Theory of Solids and Fermi Level, in Intrinsic and Extrinsic semiconductor(Only Concepts)s, conductivity of semiconductors, Hall effect, Dielectric parameter (Dielectric constant, Electric displacement, Polarization & Polarizability), Types of polarization and dielectric materials, temperature and frequency effect, Introduction of Maxwell equation, Electromagnetic wave in free space.

Reference/Text Books:

1. M. N. Avadhanulu and P.G. Kshirsagar, *A Textbook of Engineering Physics*, S Chand Publication, 9th Edition, 2011.
2. R. K. Gaur and S. L. Gupta, *Engineering Physics*, Dhanpat Rai Publications.
3. Halliday and Resnik, *Fundamental of Physics Extended*, Wiley Publication, 10th Edition, 2013.
4. D. R. Griffiths, *Introduction to Electrodynamics*, Prentice Hall Publication, 4th Edition, 2012.
5. Arthur Beizer, *Concept of Modern Physics*, McGraw Hill Publication, 6th Edition, 2003.
6. Ajoy Ghatak, *Optics*, McGraw Hill Publication, 5th Edition, 2012.
7. C.M. Srivastava and C. Srinivasan, *Science of Engineering Materials*, Wiley Publication.
8. A.J. Dekker, *Solid State Physics*, Pan MacMillan Publication, 1969.

[ME104/ME204] Engineering Graphics

Teaching Scheme:
Lecture: 2 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   **6 hrs**

Drawing standards and geometrical construction
Drawing standard SP: 46, Type of lines, lettering, dimensioning, scaling conventions.

Geometrical construction: Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and a hexagon.

Unit 2   **6 hrs**

Orthographic Projections and Projections of Points: Introduction to orthographic projection, drawing of orthographic views of objects from their isometric views. Projection of points lying in four quadrants.

Unit 3   **6 hrs**

Projections Lines and Planes and their Traces: Projection of lines parallel and perpendicular to one or both planes, projection of lines inclined to one or both planes. Traces of lines. Projection of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Unit 4   **6 hrs**

Projections of Solids: Types of solids, projections of solids with axis perpendicular and parallel to HP and VP, solids with axis inclined to one or both the planes. Projection of spheres touching each other.

Unit 5   **6 hrs**

Sectioning of Solids, Isometric Projections: Sectioning of solids: Section planes perpendicular to one plane and parallel or inclined to other plane. Isometric projection: Isometric scale, drawing of isometric projections from given orthographic views.

Unit 6   **6 hrs**

Development of surfaces and Introduction to Computer Aided Drafting: Development of surfaces: Development of cylindrical and conical surfaces Development of prisms. Introduction to computer aides: Introduction to computer aided drafting, drafting packages and tools to make drawings.

Reference/Text Books:
1. N. D. Bhatt, *Engineering Drawing*, Charotar Publishing House, 46th Edition, 2003.
2. K. V. Nataraajan, *A text book of Engineering Graphic*, Dhanalakshmi Publishers, Chennai, 2006.
3. K. Venugopal and V. Prabhu Raja, *Engineering Graphics*, New Age International (P) Ltd, 2008.

[CV105/CV205] Basic Civil Engineering

Teaching Scheme:
Lecture: 3 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   6 hrs
Introduction to Civil Engineering: Branches, role of civil engineer in various construction activities, important national projects, properties and uses of engineering materials: earth, bricks, timber, stones, aggregates, cement, steel, bitumen, glass, roofing and flooring materials, mortar, concrete.

Unit 2   6 hrs
Building Components: Foundation and superstructure. Bearing capacity, functions of foundation, shallow and deep foundations, suitability in different situation, plinth, footings, raft foundation, pile foundation, machine foundation, walls, lintels, beams, columns, slabs, roofs, staircases, floors, doors, windows, sills, weather sheds, and utility fixtures.

Unit 3   6 hrs
Building Planning & Construction: Building plans, principles of planning, site selection for buildings, typical plan of a residential building, plinth area, carpet area, cost of building, FSI, building bye laws, ventilation and lighting, loads on structure, load bearing, framed construction, steel structures, function of lintel, types of tiles, materials used for plastering & painting.

Unit 4   6 hrs
Surveying: Principles of survey, selection of stations, location sketches, site plan, triangulations and traversing, chain and tape surveying, base line and offsets, ranging and reciprocal ranging, field book, cross staff, prismatic compass, Plane table surveying, dumpy level, Levelling staff, bench marks, reduced level, contours, planimeter, total station, remote sensing, GIS, GPS, photogrammetry.

Unit 5   6 hrs
Transportation engineering: Modes, classification of roads, general cross section of road, elements of road structure and their functions, rigid and flexible pavements, traffic signs and signals, road markings. Basics of railways, airport, harbour and docks.

Unit 6   6 hrs
Environmental engineering: Environment and its components, importance and sources of water, dams, storage reservoirs, irrigation methods, watershed management and structures, ground water potential, rainwater harvesting, ground water recharge, IS specifications for drinking water, water treatment plant, need of sewage treatment & reuse of wastewater, sewage treatment plant, air pollution and its sources, air pollutants, air pollution control measures.

Reference/Text Books:
1. Anurag Kandya, *Elements of Civil Engineering*, Charotar Publishing.
2. M. G. Shah, C. M. Kale, and S. Y. Patki, *Building Drawing*, McGraw-Hill Publication.
3. Sushil Kumar, *Building Construction*, Standard Publishers Distributors.
4. M. S. Palani Gamy, *Basic Civil Engineering*, McGraw-Hill Publication.
5. Kanetkar T. P. and Kulkarni S. V., *Surveying and Levelling, Vols. I, II and III*, Vidyarthi Gruh Prakashan, Pune.
6. S. P. Chandola, *Transportation Engineering*, S. Chand Publications.

7. S.C. Rangwala, *Building Materials*, Charotar Publishing House.
8. J. K. McKay, *Building Construction - Volume I to IV*, Orient Longman Publication.
9. Satya Narayana Murty Challa, *Water Resources Engineering*, New Age Intl. Publishers.
10. B. C. Punmia, *Surveying, Vol. - I, Vol.-II, Vol.-III*, Laxmi Publications.
11. G. K. Hiraskar, *Basic Civil Engineering*, Dhanpat Rai Publications.
12. Chudley. R., *Construction Technology, Vol.1, 2, 3, 4*, ELBS Publisher.
13. C. E. Justo, and Khanna, *Highway Engineering*, Nem Chand & Bros; 10th Edition 2015.
14. *NBC 2005, National Building Code of India, Parts III, IV, VII and IX, B.I.S.* New Delhi.
15. *SP 7- National Building Code Group 1 to 5, B.I.S.* New Delhi.
16. *I.S. 962 - 1989 Code for Practice for Architectural and Building Drawings, B.I.S.* New Delhi.
17. Garg S. K., *Irrigation Engineering*, Khanna Publications, New Delhi.
18. C B I & P, *River Behaviour, Management and Training,*
19. Rao and Rao, *Air Pollution*, McGraw-Hill Publications, New Delhi.
20. Garg S. K., *Water Supply Engineering*, Khanna Publishers, New Delhi.
21. G. S. Birdi, *Environmental Engineering.*

[CHE106/CHE206] Energy and Environmental Engineering

Teaching Scheme:
Lecture: 2 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs)

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   6 hrs
Conventional Power Generation: Steam power station, Nuclear power plant – Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants.

6 hrs

Unit 2
Renewable Power Generation: Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Fuel cell, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantages and disadvantages.

Unit 3   6 hrs
Energy conservation: Scope for energy conservation and its benefits Energy conservation Principle – Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers., lighting techniques.

Unit 4   6 hrs
Air Pollution: Environment and Human health - Air pollution: sources- effects- control measures - Particulate emission, air quality standards, and measurement of air pollution.

Unit 5   6 hrs
Water Pollution: Water pollution- effects- control measures- Noise pollution –effects and control measures, Disposal of solid wastes, Bio-medical wastes-Thermal pollution – Soil pollution -Nuclear hazard.

Unit 6   6 hrs
Environmental Laws and Sustainable development: Environmental protection act- Air act- Wildlife protection act – Forest conservation act- Disaster management – urban problems related to energy, watershed management, rainwater harvesting, and water conservation.

Reference/Text Books:
1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, *A Text book of Power System Engineering*, Dhanpat Rai Publication.
2. Rai. G. D., *Non Conventional Energy Sources*, Khanna Publishers, Delhi, 2006.
3. Rao S., Parulekar B.B., *Energy Technology-Non conventional, Renewable And Conventional*, Khanna Publishers, Delhi, 2005.
4. Glynn Henry J., Gary W. Heinke, *Environmental Science and Engineering*, Pearson Education, Inc, 2004.
5. J. M. Fowler, *Energy and the Environment*, McGraw-Hill, 2nd Edition, 1984.
6. Gilbert M. Masters, *Introduction to Environmental Engineering and Science*, 2nd Edition, Prentice Hall, 2003.

[MATH201] Engineering Mathematics – II

Teaching Scheme:
Lecture: 3 hrs/week
Tutorial: 1 hr/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   6 hrs

Complex Numbers: Definition and geometrical representation; De-Moivre's theorem(without proof); Roots of complex numbers by using De-Moivre's theorem; Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in powers of $\sin \theta$, $\cos \theta$ and $\tan \theta$; Circular functions of complex variable – definition; Hyperbolic functions; Relations between circular and hyperbolic functions; Real and imaginary parts of circular and hyperbolic functions; Logarithm of Complex quantities.

Unit 2   6 hrs

Ordinary Differential Equation of First Order and First Degree: Introductory remarks - Order, degree and formation of differential equations; Solutions - variables separable, homogeneous equations, equations reducible to homogeneous form, linear equations, Bernoulli's equation, exact differential equations, equations reducible to exact equations; Application to physical and electrical systems.

Unit 3   6 hrs

Linear Differential Equations with Constant Coefficients: Introductory remarks - complementary function, particular integral; Rules for finding complementary function and particular integral; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.

Unit 4   6 hrs

Fourier Series: Introductory remarks- Euler's formulae; Conditions for Fourier series expansion - Dirichlet's conditions; Functions having points of discontinuity; Change of interval ; Odd and even function- expansions of odd and even periodic functions; Half -range series, Harmonic analysis.

Unit 5   6 hrs

Vector Calculus: Differentiation of vectors – general rules of differentiation: Velocity and acceleration; Relative velocity and acceleration; Radial and transverse components of velocity and acceleration; Law of central orbits – orbital motion; Tangential and normal components of velocity.

Unit 6   6 hrs

Applications of Vector Calculus: Scalar and vector fields; Gradient, divergence and curl; Solenoidal, irrotational vector fields; Vector identities; Integrals – line, surface and volume; Green's theorem, Gauss' divergence theorem and Stokes' theorem (without proofs).

Reference/Text Books:
1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, New Delhi.
2. P. N. Wartikar & J. N. Wartikar, *A Text Book of Applied Mathematics (Vol I & II)*, Pune Vidyarthi Griha Prakashan, Pune.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, New York.
4. Dr. B. B. Singh, *A course in Engineering Mathematics (Vol I & II)*, Synergy Knowledge-ware, Mumbai.
5. B. V. Ramana, *Higher Engineering Mathematics*, McGraw-Hill Publications, New Delhi.

6. N. P. Bali, *A Text Book of Engineering Mathematics*, Laxmi Publications.
7. Peter O' Neil, *A Text Book of Engineering Mathematics*, Thomson Asia Pte Ltd., Singapore.
8. C. R. Wylie & L. C. Barrett, *Advanced Engineering Mathematics*, McGraw Hill Publishing Company Ltd., New Delhi.

[ME102/ME202] Engineering Mechanics

Teaching Scheme:
Lecture: 3 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   **6 hrs**

Basic Concepts: Idealization of Engineering Problems, Basis of Assumptions, Objectives of Engineering Analysis and Design, Fundamental principles, free body diagram, Newton's laws, gravitation, force, resolution and composition of a forces, resultant, parallelogram law, triangle law, transmissibility, couple, moment, Varignon's theorem, co-planner concurrent and non concurrent forces, vectorial representation of forces and moments.

Unit 2   **6 hrs**

Equilibrium of Forces: Static equilibrium, 2-D and 3-D statics, analytical and graphical conditions of equilibrium, types of supports, types of load, Lami's theorem, frames, beams, support reactions, force systems in space, concurrent forces in space, couples in space, parallel forces in space, general case of forces in space, Simple trusses (plane and space), method of joints, method of sections.

Unit 3   **6 hrs**

Centroid, Friction: Centre of gravity, centroid, centroid of composite area, moment of inertia of sections, radius of gyration. Coulomb law, surface contact problems, friction angles, wedge friction, sliding friction and rolling resistance.

Unit 4   **6 hrs**

Kinematics: Types of motions, kinematics of particles, rectilinear motion, constant and variable acceleration, relative and constrained motion, motion under gravity, angular motion, relation between angular motion and linear motion, tangential and radial acceleration, relative velocity, centrifugal and centripetal forces, projectile motion, kinematics of rigid bodies, instantaneous centre of rotation.

Unit 5   **6 hrs**

Kinetics: Center of mass, mass moment of inertia, kinetics of particle, Newton's laws, D'Alembert's principle, problems on linear motion and centroidal rotation, kinetics of rigid bodies, translation, fixed axis rotation, super elevation of road and railway curves, general planar motion.

Unit 6   **6 hrs**

Work, Power, Energy: Principle of virtual work, virtual displacements for particle and rigid bodies, work done by a force, spring, potential energy, kinetic energy of linear motion and rotation, work energy equation, conservation of energy, power, impulse momentum principle, collision of elastic bodies.

Reference/Text Books:
1. S. Timoshenko and D. H. Young, *Engineering Mechanics*, McGraw-Hill, 1995.
2. Tayal A. K., *Engineering Mechanics*, Umesh Publications, 2010.
3. Bhavikatti S. S. and Rajashekarappa K. G., *Engineering Mechanics*, New Age International Publications, 2nd Edition.
4. Beer and Johnston, *Vector Mechanics for Engineers, Vol. 1 - Statics and Vol. 2 - Dynamics*, McGraw Hill Publication, 7th Edition, 1995.

5. Irving H. Shames, *Engineering Mechanics - Statics and Dynamics,* Pearson Educations, 4th Edition, 2003.
6. McLean and Nelson, *Engineering Mechanics,* Schaum's outline series.
7. Singer F. L., Engineering *Mechanics - Statics & Dynamics*, Harper and Row Publication.

[CHM103/203] Engineering Chemistry

Teaching Scheme:
Lecture: 3 hrs/week
Tutorial: 1 hr/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs)

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   6 hrs
Water Treatment: Introduction , hard and soft water, softening of water – Zeolite process, Ion exchange process, Hot Lime –Soda process, water characteristics- Hardness, Dissolve oxygen (DO), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD).

Unit 2   6 hrs
Phase Rule: Phase Rule, statement, Explanation of the terms–Phase, Components, Degrees of freedom, One component system–Water and Sulphur, Reduced phase rule equation, Two components alloy system-Phase diagram of Silver-Lead alloy system.

Unit 3   6 hrs
Metallurgy: Introduction, Occurrence of metals, types of ores, concentration of ores by physical methods- Crushing and Sizing, Froth- Flotation, Magnetic Separation, Gravity separation method. Chemical methods-Calcination, Roasting, Reduction of Ore- by Pyrolysis, Chemical reductions, Refining of Metals.

Unit 4   6 hrs
Fuels and Lubricants
Fuels: Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel-Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel- Refining of Petroleum.

Lubricants: Introduction, function of lubricants, types of lubrication – Thick film, Thin film and Extreme pressure lubrication, classification of lubricants - Solid, Semi – solid and Liquid Lubricants, properties of lubricants, Physical properties – Viscosity, Viscosity index, surface tension, Oiliness, Flash point and Fire point, Pour point and Cloud point, Chemical properties – Acidity, Emulsification, Saponification.

Unit 5   6 hrs
Study of Organic Compounds: Introduction and study of aromatic compounds.

Naphthalene: Introduction, Haworth synthesis, manufacture, physical and chemical properties, uses. Anthracene: Introduction, Haworth synthesis, manufacture, physical and chemical properties, uses. Pyridine: Structure determination, Synthesis, Manufacture, physical and chemical properties, uses. Manufacture of alcohol by Fermentation process.

Unit 6   6 hrs
Electrochemistry: Introduction-basic concepts, Transport number and its determination by Moving Boundary method, Debye-Huckel theory, Conductometric titrations, Ostwald's theory of acid-base indicator, Quinonoid theory, Electrodes – Glass electrode, Quinhydrone electrode.

Reference/Text Books:

1. Bhal and Bhal, *Advance Organic Chemistry*, S. Chand & Company, 1995.
2. Jain P. C & Jain Monica, *Engineering Chemistry*, Dhanpat Rai & Sons, 1992.
3. Bhal & Tuli, *Text book of Physical Chemistry*, S. Chand & Company.
4. Finar I. L., *Organic Chemistry (Vol. I & II)*, Longman Gr. Ltd & English Language Book Society, London.
5. Barrow G. M., *Physical Chemistry*, McGraw Hill Publication, New Delhi.
6. Shikha Agarwal, *Engineering Chemistry - Fundamentals and applications*, Cambridge Publishers, 2015.
7. O. G. Palanna, *Engineering Chemistry*, McGraw Hill Publication, New Delhi.
8. Wiley Editorial, *Engineering Chemistry*, Wiley India, 2nd Edition, 2013.

[EE104/EE204] Basic Electrical Engineering

Teaching Scheme:
Lecture: 3 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs)

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   **6 hrs**

Elementary Concepts
Prerequisite: Concept of Potential difference, Current and resistance, Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance, SI units of work Power and Energy, Conversion of energy from one form to another in electrical and thermal systems.

Unit 2   **6 hrs**

D. C. Circuits (Only Independent sources): Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Super node and super Mesh excluded). Source transformation, Star delta transformation, Superposition theorem, Thevevnins's theorem Norton's theorem, maximum power transfer theorem (Source transformation not allowed for superposition theorem, Mesh and Nodal analysis.

Unit 3   **6 hrs**

A.C. Fundamentals
Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle period, frequency, instantaneous, peak, average, 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.
Study of S.C circuits of pure resistance, inductance and capacitance and corresponding voltage- current phasor diagrams, voltage – current and power waveforms.

Unit 4   **6 hrs**

Single phase and poly phase A. C. circuits
Single phase AC Circuits: Study of series and parallel R-L, R-C, R-L-C circuits, concept of impedance and admittance for different combinations, wave form and relevant voltage current phasor diagrams, Concept of active, reactive, apparent, complex power and power factor, resonance in series and parallel RLC circuit, Q- Factor and bandwidth.

Polyphase AC circuits: Concept of three phase supply and phase sequence, Balanced and unbalanced loads voltage current and power relations in three phase balance star and delta loads and their phasor diagrams.

Unit 5   **6 hrs**

Electromagnetism: Magnetic effect of electrical current cross and dot convention, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, concepts of solenoid and torrid, Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship, Simple series and parallel magnetic circuits, comparison between electrical and magnetic circuits, force on current carrying conductor placed in magnetic field, Fleming's left hand rule, Faraday's law of electromagnetic induction, Fleming's right hand rule, statically and dynamically induced EMF's self and mutual inductance coefficient of coupling, energy stored in magnetic field.

Introduction to electrical AC DC Machines: Principles of operation and applications.

<div align="center">**Unit 6**</div> <div align="right">**6 hrs**</div>

Single phase transformer and electrostatics:

Single phase transformers: Construction, principle of working, e.m.f equations, voltage and current ratios, losses, definition of regulation and efficiency, determination of these by direct loading method. Descriptive treatment of autotransformer.

Electrostatics: electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and concept of time constant.

Reference/Text Books:

1. V. N. Mittal and Arvind Mittal, *Basic Electrical Engineering*, McGraw-Hill Publication.
2. Vincent DelToro, *Electrical engineering Fundamentals*, PHI Publication, 2nd Edition 2011.
3. Bolestaad, *Electronics Devices and Circuits Theory*, Pearson Education.
4. Edward Hughes, *Electrical Technology*, Pearson Education.
5. D. P. Kothari and Nagrath, *Theory and Problems in electrical Engineering*, PHI Publication, 2011.

[EXE105/EXE205] Basic Electronics Engineering

Teaching Scheme:
Lecture: 3 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1	**6 hrs**

Basic Concepts: Electronics and its evolution, atomic structure, permitted orbits, Quantum Numbers, periodic table, electrons in solids, bonding in solids: ionic bond, covalent bond, metallic bond, secondary bonds, atom arrangement in materials, crystalline structure of metals, classification of engineering materials: metals and alloys, ceramics, organic polymers, composite materials, classification of solids: Conductors, Dielectric materials, Magnetic materials, semiconductors, Energy band description of materials.

Unit 2	**6 hrs**

Semiconductors: Conductivity of insulators, metals and semiconductors in terms of energy bands, the chemical bond in *"Si"* and *"Ge"*, conductivity of intrinsic semiconductors, extrinsic semiconductors: *n-type and p-type* semiconductors, Hall Effect in semiconductors, Mechanism in current flow: drift and diffusion, Einstein relation, semiconductor materials: Element semiconductor, II-VI compound, III-V compounds, ternary and quaternary compounds. The junction diode: diode breakdown and current equation, diode equivalent circuit, diode as a switch, diode testing, other diodes.

Unit 3	**6 hrs**

Diode Applications And Transistors: V-I characteristics of PN-junction diode, Rectifiers: Half wave, centre tapped and bridge full wave, Zener diode regulator, voltage multiplier, clipping and clamping circuits.

Transistor: Introduction, classification, configurations, transistor as an amplifier, testing of transistor, load line analysis, biasing of the transistor, bias compensation, transistor as a switch.

Unit 4	**6 hrs**

Circuit Components:
Resistors: colour code, material used for resistors, spools for resistance coils, resistance wires, resistance standards, sheet metal resistors, frequency errors in resistors.

Capacitors: colour code, capacitance standards, variable capacitors, frequency errors in capacitors, loss angle and power factor of capacitors**.**

Inductors: standards of inductance, standards of mutual inductance, standards of self inductance, variable inductance, inductors for high and low frequency work, frequency errors in inductors.

Unit 5	**6 hrs**

Measuring Instruments & Transducers: Introduction, PMMC instrument, ohmmeter, galvanometer, potentiometers, power factor meter, frequency meters, Classification of transducers, characteristics and choice of transducers, strain gauges, thermistors, thermocouples, LVDT, Capacitive transducers, Piezo-electric transducers, opto-electronic transducers.

Unit 6	**6 hrs**

Introduction To Digital Electronics: Introduction, number system, number base conversions, basic logic gates, Universal logic gates, Boolean postulates, De-Morgan Theorems. Introduction to sequential and combinational logic circuits.

Reference/Text Books:
1. B. L. Theraja, *Basic Electronics*, S. Chand Limited, 2007.
2. Millman Halkias, *Integrated Electronics-Analog and Digital Circuits and Systems*, Mc-Graw-Hill Publication, 2000.
3. Donald Neaman, *Electronic Circuit Analysis and Design*, McGraw-Hill Publication, 3rd Edition.
4. David A. Bell, *Electronic Devices and Circuits*, Oxford Press, 5th Edition.
5. R. L. Boylstad, L. Nashlesky, *Electronic Devices and circuits Theory*, Prentice Hall of India, 9th Edition, 2006.
6. Anil K. Maini and Varsha Agarwal, *Electronic Devices and Circuits*, Wiley India Publication.
7. Phillip E. Allen, Douglas R. Holberg, *CMOS Analog Circuit Design*, Oxford Press, 2nd Edition.
8. K. R. Botkar, *Integrated Circuits*, Khanna Publication, 5th Edition

[ICT106/ICT206] Basic Computer Programming

Teaching Scheme:
Lecture: 3 hrs/week

Examination Scheme:
Internal Assessment: 20 Marks
Mid Term Test: 20 Marks
End Semester Exam: 60 Marks
(Duration 03 hrs**)**

- *All units carry 10 Marks each for End Semester Examination.*

Unit 1   **6 hrs**

Process of programming: Editing, Compiling, Error Checking, executing, testing and debugging of programs. IDE commands. Eclipse for C Program development, Flowcharts, Algorithms.

Unit 2   **6 hrs**

Types, Operators and Expressions: Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Unit 3   **6 hrs**

Control Flow: Statements and Blocks. If-else, else-if switch Loops while and for, do-while break and continue goto and Labels.

Unit 4   **6 hrs**

Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules, header files, static variables, register variables block structures initialization.

Unit 5   **6 hrs**

Arrays in C: Initializing arrays, Initializing character arrays multidimensional arrays, command line arguments.

Unit 6   **6 hrs**

Structures in C: Basics of structures, structures and functions arrays of structures, self - referential structures table lookup. Input and Output C Standard Library.

Reference/Text Books:

1. Brain W. Kernighan & Dennis Ritchie, *The C Programming Language*, Prentice Hall, 2nd Edition, 1988.
2. R. S. Bichkar, *Programming with C*, Orient Blackswan, 1st Edition, 2012.
3. Herbert Schildit, *C the Complete Reference*, McGraw-Hill Publication, 2000.

[HS102L/HS202L] Communication Skills Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 2 hrs/batch   Internal Assessment: 60 Marks
                                                          External Exam: 40 Marks

List of Practical: (Approximately 16 PR sessions)

1. Introduction to Phonemic symbols (04 hrs).
2. Articulation of sounds in English with proper manner (02 hrs).
3. Practice and exercises on articulation of sounds (02 hrs).
4. Read Pronunciations/transcriptions from the dictionary (02 hrs).
5. Practice and exercises on pronunciations of words (02 hrs).
6. Introduction to stress and intonation (02 hrs).
7. How to introduce yourself (04 hrs).
8. Group discussion (04 hrs).
9. Participating in a debate (04 hrs).
10. Presentation techniques (04 hrs).
11. Interview techniques (02 hrs).

[PHY103L/PHY203L] Engineering Physics Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 2 hrs/batch   Internal Assessment: 60 Marks
                                                   External Exam: 40 Marks

List of Practical:
At least 8 experiments should be performed from the following list.

1. Newton's rings - Determination of radius of curvature of Plano convex lens.
2. Newton's rings - Determination of wavelength of light.
3. Wedge Shaped film - Determination of thickness of thin wire.
4. Half shade Polarimeter - Determination of specific rotation of optically active material.
5. Laser - Determination of wavelength of He-Ne laser light.
6. Magnetron Tube - Determination of 'e/m' of electron.
7. G.M. Counter - Determination of operating voltage of G.M. tube.
8. Crystal Plane – Study of planes with the help of models related Miller Indices.
9. Hall Effect - Determination of Hall Coefficient.
10. Four Probe Method - Determination of resistivity of materials.
11. Measurement of Band gap energy.
12. Study of I-V characteristics of P-N junction diode.
13. Experiment on Fibre Optics.
14. B-H loop experiment.
15. Ultrasonic Inferometer.

[ME104L/ME204L] Engineering Graphics Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 4 hrs/batch   Internal Assessment: 60 Marks
                                                         External Exam: 40 Marks

List of Practical:
1. Lines, lettering and dimensioning.
2. Geometrical Constructions.
3. Orthographic projections.
4. Projections of points.
5. Projections of points.
6. Projections of points.
7. Projections of points.
8. Section of solids.
9. Isometric Projections.
10. Isometric Projections.

[CV105L/CV205L] Basic Civil Engineering Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 2 hrs/batch   Internal Assessment: 60 Marks
                                                             External Exam: 40 Marks

List of Practical:
1. Study of basic building materials.
2. Sketching Basic Components of Building.
3. Study of Detailed Building Drawings.
4. Distance Measurement by Chain, Tape and EDM.
5. Offset marking by Cross-Staff, Optical Square or Compass.
6. Demonstration of Basic Operations in Simple Levelling.
7. Study of Detailed Survey Maps such as Contour Plans, Toposheets, etc.
8. Traffic survey during peak traffic period/hours.
9. Study on standards of drinking water and various treatment processes.
10. Demonstration on Compressive strength of concrete.

[ME102L/ME202L] Engineering Mechanics Laboratory

Practical Scheme:　　　　　　　　　　　　**Examination Scheme:**
Practical: 2 hrs/batch　　　　　　　　　　　　Internal Assessment: 60 Marks
　　　　　　　　　　　　　　　　　　　　　　External Exam: 40 Marks

List of Practical:
1. Polygon law of coplanar forces.
2. Centroid of irregular shaped bodies.
3. Bell crank lever.
4. Support reaction for beam.
5. Problems on beam reaction by graphics statics method.
6. Simple / compound pendulum.
7. Inclined plane (to determine coefficient of friction).
8. Collision of elastic bodies (Law of conservation of momentum).
9. Moment of Inertia of fly wheel.
10. Verification of law of Machine using Screw jack / Worm and Worm Wheel / Single and Double Gear Crab.
11. Application of Spreadsheet Program for simple applications such as law of moments, beam reactions, problems in kinematics, etc.

Any other experiment based on syllabus of Engineering Mechanics.

[CHM103L/CMH203L] Engineering Chemistry Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 2 hrs/batch   Internal Assessment: 60 Marks
                                                            External Exam: 40 Marks

List of Practical:
1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. Determination of Dissolve Oxygen by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH – metric Titration (Acid Base titration)
6. Conduct ometric Titration (Acid Base titration)
7. Surface tension
8. Viscosity
9. To determine the normality in Normal term and Strength in gms/lit of HCl solution by titrating with Na_2CO_3 solution.
10. To find out Morality, Normality and Strength of the given $KMnO_4$ solution by titrating against N/10 Mohr's solution.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification of value of an oil sample.

[EE104L/EE204L] Basic Electrical Engineering Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 2 hrs/batch   Internal Assessment: 60 Marks
                                                          External Exam: 40 Marks

Term Work:

Term work shall consists of a record of minimum of eight experiments, out of which Group A is compulsory and five experiments from Group B be carried out.

Group-A

1. Wiring Exercise
   a) Study of wiring components (Wires, Switches, Fuses, sockets, plug, lamps and lamp holders, rating of different accessories).
   b) Control of two lamps from two switches (looping system).
   c) Stair case wiring.
   d) Use of megger for insulation testing and continuity test of wiring installation and machines.
   e) Study of fluorescent tube circuit.
   f) Study of compact Fluorescent lamps (CFL) and Light Emitting Diode (LED) lamps.
   g) Study of sodium and mercury vapour lamps.
   h) Study of safety precautions while working on electrical installations and necessity of earthing.
   i) Introduction to energy conservation.
   j) Study of single line diagram of power line.

Group B: List of laboratory experiments (Minimum five)

1. Mesh and nodal analysis.
2. Verification of super position theorem.
3. Verification of Thevevnins's theorem.
4. Study of R-L series and R-C series circuit.
5. R-L=C series resonance circuit.
6. R-L- -C parallel resonance circuit.
7. Relationship between phase and line currents and voltages in 3- phase system (Star- Deltas).
8. Power and phase measurements in three phase system by two wattmeter methods.
9. OC and SC test on single phase transformer.

[EXE105L/EXE205L] Basic Electronics Engineering Laboratory

Practical Scheme:
Practical: 2 hrs/batch

Examination Scheme:
Internal Assessment: 60 Marks
External Exam: 40 Marks

List of Practical:
1. Study of different passive components.
2. Study of DMM, function generator, power supply.
3. Study of connecting probes, CRO, DSO.
4. Study of V-I characteristics of diode.
5. Study of Zener diode in breakdown region.
6. Study and generation of half wave and full wave rectifier output.
7. Study of BJT in common emitter configuration.
8. Study of logic gates.

[ICT106L/ICT206L] Basic Computer Programming Laboratory

Practical Scheme: **Examination Scheme:**
Practical: 2 hrs/batch   Internal Assessment: 60 Marks
                                                              External Exam: 40 Marks

List of Practical:
1. Assignment on Flow Chart.
2. A Simple program to display a message "Hello world" on screen.
3. A Program to take input from user and display value entered by user on screen.
4. Basic example for performing different C Operations using operator. (With and without using scanf()).
5. Basic Program on Operator. (Using scanf()).
    a) Program to find and print area, perimeter and volume of geometric objects.
    b) Program to check a number entered by user is Perfect number or not.
6. Program to find maximum and minimum between two numbers given by user using if-else and conditional Operators.
7. Program to swap two numbers.
8. Program to print square and factorial of an entered number using while loop.
9. Program to check a number is Palindrome number or not.
10. Program to check Armstrong number.
11. Program to check and generate prime numbers up to n.
12. Program to find GCD of two entered numbers.
13. Program to find maximum and minimum from n entered numbers.
14. Program to print alternate numbers from n entered numbers.
15. Program to search an element in an Array using linear and binary search.
16. Program to print entered numbers in ascending order using sorting.
17. Program to print addition, subtraction and multiplication of Matrices.
18. Program to find length of string. (With and without using library function).
19. Programs demonstrating use of Structures, Arrays of Structures and Structure containing arrays.
20. Pattern (pyramid) printing.
    a) Pascal triangle.
    b) Floyd's triangle.
    c) Number patterns.
    d) Star (*) patterns.

[WS100L/WS200L] Workshop Practices

Practical Scheme:
Practical: 4 hrs/batch

Examination Scheme:
Internal Assessment: 60 Marks
External Exam: 40 Marks

Instructions to the student:
Each student is required to maintain a 'workshop diary' consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

List of Practical:
1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. Demonstration on use of plumbing tools and preparation of plumbing line involving fixing of water tap and use of elbow, tee, union and coupling, etc.
4. Making a small parts using GI sheet involving development, marking, cutting, bending, brazing and soldering operations- i)Tray ii) Funnel and similar articles.
5. Exercise in Arc welding (MMAW) to make a square butt joint.
6. Exercise in Resistance (Spot) welding to make a lap joint.
7. Demonstration of power operated tools related to sheet metal work, Welding, Fitting, Plumbing, Carpentry and pattern making.
8. Demonstration of step turning of a Mild Steel cylindrical job using center lathe.

Contents:
a) **Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.
b) **Welding:** Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.
c) **Fitting and Plumbing:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation, Different types of pipes, joints, taps, fixtures and accessories used in plumbing, safety precautions.
d) **Sheet Metal Work:** Simple development and cutting, bending, Beading, Flanging, Lancing and shearing of sheet metal, Sheet metal machines - Bending Machine, Guillotine shear, Sheet metal joints, Fluxes and their use.
e) **Machine shop:** Lathe machine, types of lathes, major parts, cutting tool, turning operations, safety precautions

Reference/Text Books:
1. K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi, 2010.
2. Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.