SIR PADAMPAT SINGHANIA UNIVERSITY
Udaipur
SCHOOL OF ENGINEERING
Course Curriculum of 4-Year B.Tech. Degree Programme
in
Civil Engineering
(Batch-2018-22)

Credit Structure

B.Tech. Core		B.Tech. Elective	
Category	**Credits**	**Category**	**Credits**
Departmental Core Subjects	125	Departmental Electives	9
Humanities &Basic Sciences Subjects	32	Open Electives	13
Management Subjects	2		
Total	159	Total	22
		Grand Total	181

Distribution of Total Credits & Contact Hours in All Semesters

S. No.	Semester Number	Credits/Semester	Contact hours/week
1	I	21	25
2	II	22	27
3	III	22	25
4	IV	21	24
5	V	26	29
6	VI	24	27
7	VII	32	35
8	VIII	13	17
	Total	181	--

Course Structure: B. Tech. 2018-2022

Semester - I

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-151	Engineering Mechanics	3	1	0	4
2	ME-151	Engineering Drawing & Computer Aided Drafting	0	1	1	2
3	ME-152	Manufacturing Practices	0	0	1	1
4	HU-153	Professional Communication - I	2	0	0	2
5	CH-154	Chemistry - I	3	0	1	4
6	MA-151	Mathematics - I	3	1	0	4
7	PH-151	Physics - I	3	0	1	4
					Total Credits	21
8	EP-199	Endeavour Project(Beyond the Syllabus)				
				Total Contact hours/week		25

Semester - II

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CS-152	Introduction to Computers & Programming	2	0	2	4
2	EC-152	Basics of Electrical & Electronics Engineering	3	0	1	4
3	HU-154	Professional Communication - II	1	1	0	2
4	CH-155	Chemistry - II	3	0	1	4
5	MA-152	Mathematics - II	3	1	0	4
6	PH-152	Physics - II	3	0	1	4
					Total Credits	22
7	EP-199	Endeavour Project(Beyond the Syllabus)				3
				Total Contact hours/week		27

Semester - III

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-251	Solid Mechanics	3	1	1	5
2	CE-252	Engineering Geology	3	0	1	4
3	CE-253	Building Materials	3	0	0	3
4	CE-254	Fluid Mechanics	3	0	1	4
5	HU-251	Business & Technical Communication	1	1	0	2
6	MA-251	Mathematics - III	3	1	0	4
					Total Credits	22
7	EP-299	Endeavour Project(Beyond the Syllabus)				
					Total Contact hours/week	25

Semester - IV

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-255	Surveying - I	3	0	1	4
2	CE-256	Construction Technology & Management	3	0	0	3
3	CE-257	Structural Analysis - I	3	1	0	4
4	CE-258	Building Planning, construction & Drawing	3	0	1	4
5	CE-259	Hydraulics& Hydraulic Structures	3	0	1	4
6	XX-XXX	Open Elective - I	x	x	0	2
				Total Credits		21
7	EP-299	Endeavour Project(Beyond the Syllabus)				3
				Total Contact hours/week		24

Semester - V

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-351	Structural Analysis - II	3	1	0	4
2	CE-352	Geotechnical Engineering - I	3	0	1	4
3	CE-353	Reinforced Concrete Design	3	1	0	4
4	CE-354	Concrete Technology	3	0	1	4
5	CE-355	Hydrology	3	1	0	4
6	CE-356	Surveying - II	3	0	1	4
7	XX-XXX	Open Elective - II	X	X	0	2
					Total Credits	26
8	EP-399	Endeavour Project(Beyond the Syllabus)				
					Total Contact hours/week	29

Semester - VI

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-357	Transportation Engineering - I	3	0	1	4
2	CE-358	Environmental Engineering - I	3	0	1	4
3	CE-359	Design of Steel Structures	3	1	0	4
4	CE-360	Water Resources Engineering	3	1	0	4
5	CE -361	Geotechnical Engineering - II	3	1	1	5
6	CE-3XX	Departmental Elective - I	3	0	0	3
					Total Credits	24
7	EP-399	Endeavour Project(Beyond the Syllabus)				3
				Total Contact hours/week		27

Semester - VII

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-451	Transportation Engineering - II	3	0	1	4
2	CE-452	Environmental Engineering - II	3	0	0	3
3	CE-453	Estimation & Costing	3	1	0	4
4	CE-471	Computer Application in Civil Engineering	0	0	3	3
5	CE-4XX	Departmental Elective - II	3	0	0	3
6	CE-450	Summer Internship	-	-	-	3
7	CE-455	Comprehensive Viva Voce	-	-	-	2
8	CE-460	Minor Project	0	0	3	3
9	HU-451	Interview Skills	0	0	1	1
10	MA-454	Quantitative Aptitude	0	1	0	1
11	BM-451	Ethics & IPR	2	0	0	2
12	XX-XXX	Open Elective - III	3	0	0	3
					Total Credits	32
13	EP-499	Endeavour Project(Beyond the Syllabus)				
				Total Contact hours/week		35

Semester - VIII

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-4XX	Departmental Elective - III	3	0	0	3
2	CE-470	Major Project	0	0	4	4
3	XX-XXX	Open Elective - IV	3	0	0	3
4	XX-XXX	Open Elective - V	3	0	0	3
					Total Credits	13
5	EP-499	Endeavour Project(Beyond the Syllabus)				3
				Total Contact hours/week		17

List of Departmental Elective(s) - I

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-362	Prestressed Concrete & Industrial Structures	3	0	0	3
2	CE-363	Urban Transportation Planning	3	0	0	3
3	CE-364	Ground Improvement & Ground Engineering	3	0	0	3

List of Departmental Elective(s) - II

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-458	Pavement Design	3	0	0	3
2	CE-454	Bridge Engineering	3	0	0	3
3	CE-457	Design of Foundations & Retaining Structures	3	0	0	3

List of Departmental Elective(s) - III

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CE-456	Pavement Management Systems	3	0	0	3
2	CE-461	Solid Waste Engineering	3	0	0	3
3	CE-459	Computer Aided Design	3	0	0	3

List of Open Elective(s) - I

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	HU-252	Language through Literature & Films	0	2	0	2
2	BM-270	Foundations of Economic Science	2	0	0	2

List of Open Elective(s) - II

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	HU-351	Fun with Drama	0	2	0	2
2	BM-370	Marketing Management	2	0	0	2

List of Open Elective(s) - III

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	BT-471	Bioprocess Technology	3	0	0	3
2	CE-462	Air Pollution & Industrial Waste Management	3	0	0	3
3	CS-458	Information Retrieval	3	0	0	3
4	CS-462	Management Information Systems & E-Commerce	3	0	0	3
5	EC-475	Computer Networks	3	0	0	3
6	EE-465	Energy Conversion Process	3	0	0	3
7	ME-465	Solar Energy & Applications	3	0	0	3
8	PH-451	Nanotechnology	3	0	0	3

S. No.	Course Code	Course Title	L	T	P	Credit
9	PH-453	Chaos in Engineering Systems	3	0	0	3

List of Open Elective(s) - IV

S. No.	Course Code	Course Title	L	T	P	Credit
1	BT-475	Bioremediation Technology	3	0	0	3
2	CE-464	Environmental Management	3	0	0	3
3	CS-459	Statistical Simulation & Data Analysis	3	0	0	3
4	EC-473	Robotics & Automation	3	0	0	3

List of Open Elective(s) - V

S. No.	Course Code	Course Title	L	T	P	Credit
1	BT-472	Bioelectronics & Biosensors	3	0	0	3
2	CS-461	Soft Computing	3	0	0	3
3	EE-466	Hydro Power Generation	3	0	0	3
4	MA-453	Mathematical Statistics	3	0	0	3
5	ME-467	Total Quality Management	3	0	0	3

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Semester - I

(Departmental Core Subject)

CE-151   L-T-P-C
Engineering Mechanics   3-1-0-4

Objective: *The subject deals with the concepts of static & dynamic systems involving kinematic & dynamic analysis.*

Course Content

Basic principles: Equivalent force system; Equations of equilibrium; Free body diagram; Reaction; Static indeterminacy. Structures: Difference between trusses, frames & beams, Assumptions followed in the analysis of structures; 2D truss; Method of joints; Method of section; Frame; Simple beam; types of loading & supports; Shear Force & bending Moment diagram in beams; Relation among load, shear force & bending moment. Friction: Dry friction; Description & applications of friction in wedges, thrust bearing (disk friction), belt, screw, journal bearing (Axle friction); Rolling resistance. Virtual work & Energy method: Virtual Displacement; Principle of virtual work; Applications of virtual work principle to machines; Mechanical efficiency; Work of a force/couple (springs etc.); Potential energy & equilibrium; stability. Center of Gravity & Moment of Inertia: First & second moment of area; Radius of gyration; Parallel axis theorem; Product of inertia, Rotation of axes & principal moment of inertia; Moment of inertia of simple & composite bodies. Mass moment of inertia. Kinematics of Particles: Rectilinear motion; Curvilinear motion; Use of Cartesian, polar & spherical coordinate system; Relative & constrained motion; Space curvilinear motion. Kinetics of Particles: Force, mass & acceleration; Work & energy; Impulse & momentum; Impact problems; System of particles. Kinematics & Kinetics of Rigid Bodies: Translation; Fixed axis rotational; General plane motion; Coriolis acceleration; Work-energy; Power; Potential

energy; Impulse-momentum & associated conservation principles; Euler equations of motion & its application.

Text/Reference Books
1. Engineering Mechanics: Statics & Dynamics. Shames I. H. 4th Ed. PHI. 2002.
2. Engineering Mechanics. Vol I - Statics, Vol II - Dynamics. Meriam J. L. & Kraige L. G. 5th Ed. John Wiley. 2002.
3. Engineering Mechanics. Vol. I & II. Hibbler R. C. Pearson Press. 2002.

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Semester- I

(Departmental Core Subject)

ME-151   L-T-P-C
Engineering Drawing & Computer Aided Drafting   0-1-1-2

Objective: *Engineering drawing is a visual language of an engineer. It permits students to convert an object into its visual representation.*

Course Content

Importance of engineering drawing; Conventions & standards: ISO; Scales; Curves; Orthographic projections : points, lines, planes & solids; Sections of solids; Isometric projections; Development of surfaces; Intersection of solids.

List of Experiments

1. Introduction to Engineering Graphics, Sheet Layout, instruments, BIS standards, Lines, Lettering & Dimensioning

2. Scales -Types of Scales-Plain Scale, Diagonal scale, vernier scale

3. Curves- conic sections, ellipse, parabola, hyperbola, cycloid, epicycloid, hypocycloid

4. Orthographic Projections-Introduction, multi-view projection system, orthographic views, Methods of multi-view projections, projecting side views, Sectional Views

5. Projection of Points -Introduction, position of points in I, II, III & IV quadrant

6. Projection of Lines & Auxiliary projections-, Line inclined to one plane & parallel to the other-Line inclined to both the planes. Projection on auxiliary planes

7. Projection of Planes- Introduction, Perpendicular & parallel to the reference planes Projections of planes inclined to one reference plane & perpendicular to the other, plane inclined to both ref. planes

8. Projection of solids with axes inclined to one of the reference plane & parallel to the other

9. CAD Software - Fundamentals of 2-D, Drawing & Edit commands. Draw 2D& 3D object drawing

10. Section of Solids- Sections of prisms, pyramids, cone cylinder

11. Development of Surfaces- Methods of development-Cube, prisms, pyramids, cone cylinder

12. Intersection of Surfaces- Line method-cutting plane method, Intersection of two prisms- Intersection of cylinder & cylinder

13. Isometric Projection- Isometric axes lines & planes, Isometric Scale, Isometric views of standard shapes, solids

Text/Reference Books
1. Engineering Drawing. Dhananjay A.J. Tata McGraw-Hill. 2008
2. Engineering Drawing. Bhatt N. D. & Panchal V.M. 43th Ed. Charator Publishing House. 2001.
3. Engineering Drawing. Shah M. B. & Rana B. C. 2nd Ed. Pearson Education. 2009.
4. Graphic Science & Design. French T. E., Vierck C. J. & Foster R. J. 4th Ed. McGraw-Hill. 1984.
5. Fundamentals of Engineering Drawing. Luzadder W. J. & Duff J. M. 11th Ed. PHI. 1995.
6. Engineering Drawing & Graphics. Venugopal K. 3rd Ed. New Age International. 1998.

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Semester - I

(Departmental Core Subject)

ME-152   L-T-P-C
Manufacturing Practices   0-0-1-1

Objective: *This course is intended to impart basic knowledge of various hand tools & their usage in different sections of manufacturing; including Carpentry, Fitting, House wiring, Black smithy, Tin smithy.*

List of Experiments

1. Demonstration of the manufacturing practices, workshop safety, trades, tools, experiments
2. Measurement of the dimensions of a given job using precision instruments
3. Fabrication of a fitting job with drilling & tapping of a hole
4. Preparation of a funnel with spout as per drawing from 30 SWG. G.I sheet. Joints to be soldered with the soldering iron
5. Fabrication of a T-half lap joint & T-bridle joint
6. Preparation of a wooden patterns as per given drawings
7. Preparation of a mould for a given wooden pattern
8. Preparation of an aluminum casting with the help of a given wooden pattern

Text/Reference Books
1. Elements of Workshop Technology-Vol. I. Choudhury H. Asia Publishing House. 1986.
2. All About Machine Tools. Gerling H. New Age International. 1995.
3. Workshop Technology. Chapman W. A. J. Oxford IBH. 1975.
4. Lab Manual on Manufacturing Practice Lab. Dept. of Mech. Engg. SPSU.

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Semester - I

(Humanities & Basic Sciences Subject)

HU-153   L-T-P-C
Professional Communication - I   2-0-0-2

Objective: *To develop communicative competence*

Course Content

Communication: Importance of effective communication skills, Objectives & Process of communication; Types of communication: Verbal & non-verbal; Channels of communication, Media of communication; Barriers to communication: Physical, Psychological, Mechanical, Linguistic & Cultural; Types of listening, Principles of effective listening

Word Power: Words often misspelt, One word substitute, Use of idiomatic expressions & phrases

Time & Stress Management: Planning, Scheduling & Prioritizing, Multitasking, Delegating; Saying no assertively; Stress & its causes, Barriers to stress management & Handling stress

Text/Reference Books
1. Technical Communication. Raman M. & Sharma S. Oxford University Press. 2004.
2. Essentials of Business Communication. Pal R. & Korlahalli J. Sultan Chand & Sons. 2011.
3. Word Power Made Easy. Lewis N. 2nd Ed. Goyal Publisher. 2011.

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Semester - I

(Humanities & Basic Sciences Subject)

CH-154   L-T-P-C
Chemistry - I   3-0-1-4

Objective: *The subject deal with the concepts related to Physical chemistry & develops a scientific attitude by means of distinguishing, analyzing & solving various engineering problems. It also provides in-depth knowledge of thermodynamics, quantum chemistry, chemical kinetic, corrosion & colloids.*

Course Content

Concept of Thermodynamic system: Definition with example of di thermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property. Introduction to first law of thermodynamics: different statements, mathematical form. Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas. Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. Heat Capacity**:** Definition, Classification of Heat Capacity (Cp & Cv): Definition & General expression of Cp - Cv. Expression of Cp - Cv for ideal gas. Reversible & Irreversible processes: Definition, Work done in Isothermal Reversible & Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V & T), slope of P-V curve in adiabatic & isothermal process. Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier & Laplace, Hess's law of constant heat summation, Kirchhoff's law.2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle).Joule

Thomson & throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. Evaluation of entropy: characteristics & expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. Work function & free energy: Definition, characteristics, physical significance, mathematical expression of ΔA & ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Condition of spontaneity & equilibrium reaction. Chemical potential, Real gas, Real Solution, Cell EMF & its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half-cell, quinhydrone half-cell & calomel half-cell (construction, representation, cell reaction, expression of potential, Discussion, Application)Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application).Application of EMF measurement on a) Ascertain the change in thermodynamic function (ΔG, ΔH, ΔS) b)ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion. Corrosion - basics & impacts, Reaction laws: rate & order; molecularity; zero, first & second order kinetics. Pseudo unimolecular reaction, Arrhenius equation. Mechanism & theories of reaction rates (Transition state theory, Collison theory: Steady state approximation, Rate determining state approximations, Bohr's theory & its limitations, de-Broglie relation, Heisenberg Uncertainty principle, Schrodinger equation, Schrodinger equation for hydrogen atom in Cartesian coordinate & polar coordinates, Significance of four quantum numbers, shape of s, p & d atomic orbitals, discovery of spin, spin quantum number & magnetic quantum number. Rules for filling electrons in orbitals, stability of half & completely filled orbitals, relative energies of atomic orbitals, anomalous electronic configurations, The properties of liquid surface, surfactants, colloidal systems, solid surfaces, physio sorption, & chemisorption.

List of Experiments

1. Determination of water hardness by complexometric titration.
2. Determination of total alkalinity of water sample.
3. Determination of chloride ion in water sample by Argentometric method.

4. Determination of total dissolved oxygen content in water sample by Wrinkler's method.

5. Copper sulfate estimation by iodometric titration.

6. Potassium dichromate estimation by iodometric titration.

7. Redox titration: Estimation of FAS by internal & external indicators.

8. Gravimetric analysis: Estimation of Ba as $BaSO_4$

9. Gravimetric analysis: Estimation of Ag as AgCl

10. pH metric measurements: Determination of strength of unknown HCl solution by pH metric titration.

Text/Reference Books
1. Physical Chemistry. Atkins P. W. 5th Ed. ELBS. 1994.
2. Physical Chemistry. Levine I. A. 4th Ed. McGraw-Hill.1995.
3. Quantum Chemistry. Levine I. A. 2nd Ed. Prentice Hall. 1995.
4. Introductory Quantum Chemistry. Chandra A.K. 4th Ed. Tata McGraw-Hill. 1994

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Semester - I

(Humanities & Basic Sciences Subject)

MA-151   L-T-P-C
Mathematics - I   3-1-0-4

Objective: *To develop an understanding of the fundamental concepts of the calculus, differential equations & linear algebra to connect them with real world problems from other disciplines along with the development of mathematical reasoning & problem solving abilities.*

Course Content

Differential Calculus (Functions of one variable): Taylor's & Maclaurin's theorems with remainders, concavity & convexity of a curve, points of inflexion, asymptotes & curvature.

Differential Calculus (Functions of several variables): Partial derivatives & their geometrical interpretation, derivatives of composite & implicit functions, Euler's theorem on homogeneous functions, harmonic functions, Taylor's expansion of functions of several variables, maxima & minima - Lagrange's method of multipliers.

Integral Calculus**:** application to length, area, volume & surface area of revolution. Multiple integrals with applications to: volume, surface area & moments of inertia.

Ordinary Differential Equations**:** Solution of dy/dx = f(x, y); linear differential operator L, higher order ordinary differential equations with constant coefficients.

Matrix Algebra**:** Rank & inverse of a matrix, consistency of linear system of equations; Eigen values, Eigen vectors & their applications to system of ordinary differential equations; Cayley-Hamilton theorem; Diagonalization of matrices.

Text/Reference Books

1. Higher Engineering Mathematics. Ramana B.V. 1st Ed. Tata McGraw-Hill Education. 2006.
2. Calculus & Analytic Geometry. Thomas G. B. & Finney R. L. 9th Ed. Addison-Wesley. 1998.
3. Advanced Engineering Mathematics. Kreyszig E. 10th Ed. Wiley Eastern. 2012.
4. Advanced Engineering Mathematics. Jain R. K. & Iyengar S. R. K. 3rd Ed. Narosa Publishing House. 2010.
5. Calculus - Vol.2. Apostol T. M. 2nd Ed. Wiley .2003.
6. Higher Engineering Mathematics. Grewal B. S. 42^{nd}Ed.Khanna Publishers. 2012.

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Semester - I

(Humanities & Basic Sciences Subject)

PH-151   L-T-P-C
Physics - I   3-0-1-4

Objective: *Objective of this course is to introduce concepts of electrostatics & magnetostatics leading to the Maxwell's electromagnetic waves & understanding the wave nature of light using various optical phenomena like interference, diffraction & polarization. The particle nature of electromagnetic wave will also be introduced.*

Course Content

Gauss law & its applications in electrostatics in vector form, electric polarization, permittivity, energy density in an electric field, Ampere's law, charged particle motion in E & B fields, magnetization, Faraday's law of electromagnetic induction; Equation of continuity, generalized Ampere's law, Maxwell's equations, wave equation, plane wave solutions, electromagnetic wave propagation in dielectrics & conductors, reflection/refraction, polarization, interference, diffraction of EM waves Origin of quantum hypothesis, de Broglie's hypothesis of matter waves, Uncertainty principle, Wave function & wave mechanics, Schrodinger equation, QM operators, Expectation value, one-dimensional solutions: zero potential, step potential, potential barrier & potential well.

List of Experiments

1. Determination of wavelength of sodium light source using Newton's Ring Method
2. Determination of wavelength of monochromatic light source using Fresnel's Biprism

3. Determination of the wavelength of monochromatic light using Michelson Interferometer

4. Determination of wavelength of laser using single slit diffraction

5. Determination of the wavelength of prominent lines of mercury using plane transmission grating

6. Determination of specific rotation of sugar solution using Polarimeter

7. Determination of Refractive index & dispersive power of prism material using spectrometer

8. Verification of the Biot Savart's law

9. Variation of magnetic field along the axis of a circular coil & determination of the radius of the coil

10. Determination of frequency of AC mains using Sonometer

11. Determination of the characteristic constant or ballistic constant of a ballistic galvanometer

Text/Reference Books
1. Elements of Electromagnetics. Sadiku M. N. O. 6th Ed. Oxford. 2014.
2. Optics. Ghatak A. Tata McGraw-Hill Publishing Company Ltd. 2005.
3. Electromagnetics. Laud B. B. 2nd Ed. New Age International (P) Ltd. 1987.
4. Classical Electrodynamics. Jackson J. D. 3rd Ed. Wiley. 1998.
5. Foundations of Electromagnetic Theory. Reitz J. R., Milford F. J. & Christy R. W. 4th Ed. Narosa Pub. House. 2008.
6. Fundamentals of Optics. Jenkins F. A. & White H. E. 4th Ed. McGraw-Hill International Ed.s. 2001.

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Semester - II

(Departmental Core Subject)

CS-152   L-T-P-C
Introduction to Computers & Programming   2-0-2-4

Objective: *This course is an introductory course of computer science. It provides basic insight into the building blocks of a modern day computer & the newest peripherals attached with it. In addition to this, the learner is delved into the basic programming concepts of a high level language.*

Course Content

Introduction to computer architecture; memory, ALU, CPU, I/O devices. Introduction to system software; operating systems, compilers & multi-user environments. Concept of an algorithm. Introduction to the design & implementation of correct, efficient & maintainable programs. Use of high level programming language for the systematic development of programs.

List of Experiments
1. Basic & calculation based programs
2. Conversion based programs
3. Decision making statement & operator based programs
4. Loop based programs
5. Multi way decision making statement based programs
6. Array based programs
7. Strings based programs
8. Function based programs
9. Structure based programs

10. Pointers based programs

11. File handling based programs

Text/Reference Books

1. A Book on C. Kelly A. & Pohl I. 4th Ed. Pearson Education. 1999.
2. The C Programming Language. Kernighan B. & Ritchie D. 2nd Ed. Prentice Hall of India. 1988.
3. C: The Complete Reference. Schildt H. 4th Ed. Tata McGraw-Hill. 2000.

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Semester - II

(Departmental Core Subject)

EC-152   L-T-P-C
Basics of Electrical & Electronics Engineering   3-0-1-4

Objective: *The aim of this course is to develop an understanding of the basics of electrical & electronics components, circuits & systems, operation of transformers & other electrical machines.*

Course Content

Circuit Analysis Techniques: Circuit elements, Simple RL & RC Circuits, Ohm's law, Kirchoff's laws, Nodal Analysis, Mesh Analysis, Linearity & Superposition, Source Transformations, Thevnin's & Norton's Theorems, Phasor Relationship for R, L & C, Impedance & Admittance, Phasor Diagrams, Response as a function of ω.

Diodes & Transistors: Semiconductor Diode, Zener Diodes, Rectifier Circuits, Wave Shaping Circuits, Bipolar Junction Transistors, Field-Effect Transistors.

Operational Amplifiers: Op-amp Equivalent Circuit, Practical Op-amp Circuits, DC Offset, Constant Gain Multiplier, Voltage Summing, Voltage Buffer.

Logic Gates: Number Systems & Codes, Logic Gates, Boolean Theorems, De Morgan's Theorems, Sum-of Product Form, Algebraic Simplification, Karnaugh Map Method.

Introduction to Transformers & AC Machines: Ideal Transformer, Circuit Model of Transformer, Efficiency, Three Phase Induction Motor.

Introduction to Fractional-kW Motors & DC Machines: Single Phase Induction Motors, DC Generator & DC Motor.

List of Experiments

1. Study & Verification of Kirchoff's Current Law

2. Study & Verification of Kirchoff's Voltage Law

3. Study & Verification of Thevenin's Theorem for dc network

4. Study & Verification of Norton's Theorem for dc network

5. Study & Verification of R-C series circuit & determination of phase angle

6. Study of the volt-ampere (V-I) characteristics for Silicon P-N Junction diode

7. Study of the volt-ampere (V-I) characteristics for a Zener diode

8. Study of the input & output characteristics for a transistor in common base configuration

9. Verification of Truth Table for basic & universal logic gates

10. Determination of copper loss & core loss for a single phase transformer through O/C-S/C Test

Text/Reference Books
1. Engineering Circuit Analysis. Hayt W. H. & Kemmerly J. E. McGraw-Hill. 1993.
2. Circuits, Devices & Systems. Smith R. J. & Dorf R. C., John Wiley & Sons.1992.
3. Electronic Devices & Circuit Theory. Boylestad R. L. & Nashelsky L. 6th Ed. Prentice Hall India. 2001.
4. Digital Systems. Tocci R. J. 6th Ed. Prentice Hall India. 2001.
5. Electrical Engineering Fundamentals. Del T. V. Prentice Hall India. 1994.
6. Circuit Theory (Analysis & Synthesis). Chakrabarti A. Dhanpat Rai & Co. 2001.

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Semester - II

(Humanities & Basic Sciences Subject)

HU-154   L-T-P-C
Professional Communication - II   1-1-0-2

Objective: *To build interpersonal skills & communicate effectively.*

Course Content

Business Meetings: Notice, Agenda, Minutes of Meeting.

Group Discussions: Classification of GD topics; GD as a part of the selection process;

GD phases; Non-verbal communication in GD, Do's & don'ts of GD.

Professional Mannnerisms & Grooming: Kinesics, Office etiquette; Telephone skills,

Netiquette.

SWOT, Résumé, Cover letter writing, Job Acceptance Letter.

Goal setting: Significance, Progressive steps to achieve goals; Anticipating career

challenges & utilizing opportunities.

Text/Reference Books
1. Foundations of Business Communication: An Integrative Approach. Young, D. McGraw Hill Education. 2005.
2. How to Succeed in Group Discussions & Personal Interviews. Mandal S. Jaico Publishers. 2004.
3. Business Communication: Connecting in a Digital World (SIE). Lesikar R. & Pande N. McGraw Hill Education. 2015.

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Semester - II

(Humanities & Basic Sciences Subject)

CH-155   L-T-P-C
Chemistry - II   3-0-1-4

Objective: *This course aims at understanding various concepts of inorganic & organic chemistry, broad spectrum knowledge of chemical bonding, organic reaction mechanism, stereochemistry, spectroscopy, polymer science, green chemistry & environmental pollution studies.*

Course Content

Bonding Models in Inorganic Chemistry- Introduction, Ionic bonding: Introduction to stoichiometric defects (Schottky & Frenkel) & non - stoichiometric defects (Metal excess & metal deficiency).Role of silicon & germanium in the field of semiconductor. Valence shell Electron Repulsion Theory (VSEPR). Discussion of structures of IF_3, $SnCl_2$, CO_3^{2-} & Valence bond theory, Molecular orbital theory Linear combination of atomic orbitals (LCAO) method. Structures of simple hetero nuclear diatomic molecules such as CO, NO, HF, Coordination numbers, Crystal field theory, Metal ions in Biological systems, Air Pollution Types of pollutants, source effects, sink & control of primary pollutants - CO, NOx, HC, SOx & particulates, effects of pollutants on man & environment - photochemical smog & acid rain. Greenhouse effect, ozone layer depletion, Water Pollution: Classification of pollutants, their sources, effects of water pollutions on human & plant life, waste water treatment - domestic & industrial. Pollution due to Oil & grease in water. Thermal pollution: Sources, effects of thermal pollution on plant & animal life, control techniques, radioactive pollution: sources, effects, treatment & disposal, Solid Waste Management, Weapons of mass destruction, biological weapons, chemical weapons, disarmament & peaceful uses of chemistry in day to day life. Green

Chemistry, 12 principles of green chemistry, application of green chemistry in industrial processes, Renewable & Non-renewable energy resources & Primary & Secondary energy resources, Polymers, Organic Reaction Mechanism, Stereochemistry of Carbon Compounds, Basic concepts of spectroscopy, UV-VIS spectroscopy, applications, Fundamentals of Microwave & IR spectroscopy & its applications, determination of molecular structure.

List of Experiments

1. Inorganic qualitative analysis: Detection of acid radicals.

2. Inorganic qualitative analysis: Detection of basic radicals.

3. Estimation of available chlorine in bleaching powder sample.

4. Thin layer chromatography: Separation of given amino acids by TLC method.

5. Determination of rate constant of a first order reaction by titrimetric method.

6. Spectrophotometry: Verification of Beer's law.

7. Conductometric measurements: Determination of strength of unknown HCl solution by conductometric titration.

8. Qualitative analysis of single solid organic compounds: Detection of characteristic elements (N, Cl,Br & I) by chemical tests.

9. Qualitative analysis of single solid organic compounds: Detection of functional groups by systematic chemical tests.

10. Flame photometry: Determination of Na & K in water sample.

Text/Reference Books

1. Environmental Sciences towards sustainable future. Wright R. Prentice Hall of India. 2007.
2. Essentials of Ecology & Environmental sciences. Rana S. V. S. 3rd Ed. Prentice Hall of India. 2007.
3. Ecology. Subrahmanyam S. & Sambamurty S. S. 2nd Ed. Narosa Publishing House. 2007.
4. Concepts of Ecology. Kormondy E. J. 4th Ed. Prentice Hall of India Pvt. Ltd. 2007.
5. Textbook of Environmental Studies for Undergraduate Courses. Bharucha E. 2nd Ed. University Grants Commission. New Delhi. 2004.
6. Advanced Inorganic Chemistry. Cotton F. A. & Wilkinson G. 3rd Ed. Wiley Eastern Ltd. 1972.
7. Inorganic Chemistry. Shriver D. J. Atkins P. W. & Langford C. H. 2nd Ed. ELBS.

1994.

8. Organic Chemistry. Pine S. H. 5th Ed. McGraw-Hill. 1987.
9. Fundamentals of Molecular Spectroscopy. Banwell C. N. & McCash E. M. 4th Ed. McGraw-Hill. 1962.
10. Introduction to Molecular Spectroscopy. Barrow G. M. 5th Ed. McGraw-Hill 1962.
11. Green Chemistry Engineering. Doble M. & Kruthiventi A. K. Academic press.2007.

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Semester - II

(Humanities & Basic Sciences Subject)

MA-152   L-T-P-C
Mathematics - II   3-1-0-4

Objective: *The objective of the course is to make the students familiar with certain important mathematical techniques involving complex analysis & transforms which have applications in various disciplines of Engineering & Technology.*

Course Content

Complex Analysis**:** Complex Variables: Limit, continuity, differentiability & analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy's integral theorem, independence of path, existence of indefinite integral, Cauchy's integral formula, derivatives of analytic functions, Taylor's series, Laurent's series, Zeros & singularities, Residue theorem, evaluation of real integrals.

Transform Calculus: Definition of Laplace Transform, linearity property, conditions for existence of Laplace Transform. First & second shifting properties, Laplace Transform of derivatives & integrals, unit step functions, Dirac delta-function, error function. Differentiation & integration of transforms, convolution theorem, inversion, periodic functions. Evaluation of integrals by Laplace Transform. Solution of initial & boundary value problems. Fourier Transform, Fourier sine & cosine transforms. Linearity, scaling, frequency shifting & time shifting properties. Self reciprocity of Fourier Transform, convolution theorem. Applications to boundary value problems. Brief Introduction of Z-Transform, Mellin transform & Wavelet Transform.

Fourier Series : Periodic functions, Fourier series representation of a function, half range series, sine & cosine series, Fourier integral formula, Parseval's identity.

Text/Reference Books

1. Higher Engineering Mathematics. Ramana B. V. 1st Ed. Tata McGraw-Hill Education. 2006.
2. Complex Analysis for Mathematics & Engineering .Mathews J. H. & Howell R. W. 3rd Ed. Narosa. 1998.
3. Advanced Engineering Mathematics .Kreyszig E. 10th Ed. Wiley Eastern. 2012.
4. Advanced Engineering Mathematics. Jain R. K. & Iyengar S. R. K. 3rd Ed. Narosa Publishing House.2009.
5. Complex Variables- Introduction & Applications. Ablowitz M. J. & Fokas, A. S. Cambridge University Press. 1998
6. Complex Variables & Applications .Brown J. W. & Churchill R. V. 7th Ed. Mc-Graw Hill. 2004.

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Semester - II

(Humanities & Basic Sciences Subject)

PH-152   L-T-P-C
Physics - II   3-0-1-4

Objective: *The objective of this course to introduce the notion of quantum physics & its applications in understanding the electrical, thermal & magnetic properties of various materials, band theory of solids, nanostructures, lasers, superconductivity & its applications.*

Course Content

Nature of waves & particles, Wave-packets & uncertainty, Wave particle duality, Wave mechanics & its mathematical tools, Classical & quantum statistics, Statistics of discrete energy levels, Black body spectral density, Bose condensation; Free electrons, density of states, Kronig-Penny model, Effective mass, Band structure, Electrons in various types of solids, Particle in quantum well, Harmonic oscillator & Hydrogen atom problems, Application to semiconductor doping, Nonperiodic materials; Tunneling of particles & examples, Tunneling through multiple barriers & semiconductor junctions; Interaction among quantum wells: materials under electric & magnetic fields, magnetic resonance effects; Nanostructures - Concepts of electrons in low dimensional confinement, Quantum wells & Super-lattices leading to new device concepts; Lasers - Einstein coefficients, Population inversion, Light amplification, Optical resonators, Characteristics of lasers; Superconductors -Vortex, Flux quantization, SQUID, Levitation & its applications.

List of Experiments

   1. Determination of Planck's constant using Light Emitting Diode

2. Determination of temperature coefficient, reverse saturation current & energy band gap of a P-N junction

3. Determination of the energy band gap of semiconductor using four-probe method

4. Determination of the charge carrier concentration & Hall coefficient of a given semiconductor using Hall experiment setup

5. Determination of the ratio of e/m for the electron using the helical method

6. Determination of electronic charge by Millikan's oil drop method

7. Determination of velocity of ultrasonic waves using quartz crystal

8. Determination of wavelength of He-Ne laser using millimeter scale as a grating

9. Determination of wavelength of Diode laser using single slit / double slit & obtain diffraction patterns of different apertures

10. Determination of numerical aperture of an optical fibre cable

11. Determination of capacitance of a parallel plate capacitor with & without dielectric material

12. Determination of the height of a distant object/building with the help of sextant

Text/Reference Books
1. Concepts of Modern Physics. Beiser A. 5th Ed. McGraw-Hill.1995.
2. Modern Physics. Krane K. S. 2nd Ed., John-Wiley. 1995.
3. Quantum Physics of Atoms, Molecules, Solids, Nuclei & Particles. Eisberg R. & Resnick R. 2nd Ed. John-Wiley. 1985.
4. Introduction to Solid State Physics. Kittel C. 7th Ed. John-Wiley India Pvt. Ltd. 1995.
5. Solid State Physics. Pillai S. O. 6th Ed. New Age International Publishers Ltd. 2009.
6. Semiconductor physics & devices. Neamen D. 4th Ed. McGraw-Hill. 2011.

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EP-199/EP-299/EP-399/EP-499   L-T-P-C
Endeavour Project (Beyond the Syllabus)   0-0-0-3

Our University is continuously looking at innovative ways to deliver knowledge to our students, making learning & delivery mechanism innovative, interesting & easy with truly 'out of the box' teaching-learning process. This beyond the syllabus initiative uses all working second Saturdays as class days.

Endeavour is a compulsory interdisciplinary project for all students of the University. Respective Heads of the Department shall select students & form groups. Each project shall be supervised by a faculty member.

The faculty of SPSU will select a contemporary topic, which is preferably industry relevant & associate a company or professional who can provide application-oriented perspective. The topic chosen may be from wide range of subjects. For example: - Biodiversity, Social subjects, Media & advertisement, Environment, Scientific, Technical, Management, Architecture, Tourism or any other subject or their combination.

The project is evaluated in two phases: Internal Evaluation & External Evaluation. This ensures descriptive assessment of the projects performance & challenges faced during the implementation of the project. The project will be spread over two semesters beginning from the odd semester (July to November) & ending in the even semester (December to May) every year. The grade obtained in this course may be used to improve the student's semester grade point average.

The final report should include the reasons for the choice of the title, the concept, the structure, the results with working models/drawings etc. & its practicality. The role & responsibility of every individual of the group should be indicated clearly. The report should be written in the prescribed format/guidelines, certified by the faculty member & presented as a seminar.

The project is evaluated as per the approved procedure & marks obtained are computed in the even semester.

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Semester - III

(Departmental Core Subject)

CE-251   L-T-P-C
Solid Mechanics   3-1-1-5

Objective: *This course is designed to understand the concepts of stress, strain, deformation of solid & state of stress. This course will also help to understand the concepts of strain energy principal stress & principal planes, bending moment, shear force & the corresponding stress distribution for different types of beams; & to analyze plane truss, thin cylinders & shells.*

Course Content

Force Transmission & Deformation, continuum, isotropy, homogeneity, conservation of linear momentum, angular momentum & mass, Cauchy Axiom & definition of stress tensor, equation of equilibrium, Principal stress & Principal plane, Strain at a Point: Displacement of apoint & relative displacement of line segments, Green Lagrange strain tensor & small strain tensor, Compatibility requirements, Constitutive Relationships between various material constants for linear elastic materials, Boundary Value Problems, Energy Formulation for deformable body: Principle of minimum potential energy, Virtual work method, Failure criteria for materials, uniaxial tension in bar, thermal stresses. Torsionof right circular section & non-circular section, Bending of Beams, bending moment & shear force diagrams, Stresses due to shear, Shear center, Deflection of beams, Buckling of Columns: Euler's formula, different end conditions & effective length, energy method.

List of Experiments

1. Tension test

2. Compression test

3. Flexure test

4. Impact test

5. Torsion test

6. Hardness test

Text/Reference Books

1. Mechanics of Materials. Gere J. M. & Timoshenko S. P., 4th Ed. CBS Publisher.1996.
2. Solid mechanics. Kazimi S. M. A., First revised Ed. Tata McGraw Hill. 2006.
3. Introduction to Solid Mechanics. Pitarresi J. M. Prentice Hall of India. 2000.

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Semester - III

(Departmental Core Subject)

CE-252   L-T-P-C
Engineering Geology   3-0-1-4

Objective: *This course is designed to impart basic geological knowledge to civil engineering students. The course will inspire the students to think clearly & critically the solution of the civil engineering problems in the context of geology. The course will help students to examine the role of geologists in engineering projects.*

Course Content

The Earth: a system approach; Earth Processes & their consequences: Lithosphere, Hydrosphere, Cryosphere, Atmosphere, Biosphere &Properties of Rocks: Rock Mass Strength; Weathering; Structures: Folds, Faults, Joints; Plate Tectonics, Earthquakes: Causes, classification, magnitude, intensity, seismic hazards zoning; Groundwater: resources & quality; Site Investigation: S. I. Desk Study; Remote sensing, GIS & GPS: Basic principles & applications, Boreholes; Landslides & Subsidence: causes, classification & monitoring; Rock excavation: Cut Slopes in rocks; Criteria & factors for site selection for dams, tunnels, waste/radioactive disposal sites.

List of Experiments

1. Megascopic identification of minerals
2. Megascopic identification of igneous rocks
3. Megascopic identification of sedimentary rocks
4. Megascopic identification of metamorphic rocks
5. Geological maps
6. Structural geology- faults, folds & fissures

7. Plate tectonics

Text/Reference Books

1. Foundations of Engineering Geology. Waltham A. C. 1st Ed. Blackie Academic & Professional. Chapman & Hall. 1997.

2. General Geology for Engineers. Allan K., First revised Ed. Tata McGraw Hill.2006.

3. Engineering Geology. Kesavulu P. 2nd Ed. Oxford University Press. 1999.

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Semester - III

(Departmental Core Subject)

CE-253   L-T-P-C
Building Materials   3-0-0-3

Objective: *The course is designed to impart the knowledge of origin, development & use of common building materials. The course aim is to educate the participant different properties of the materials utilized in building construction.*

Course Content

Introduction to structures of solids, ductility, brittleness, strength, stiffness, durability, hardness, toughness; Weakness of materials, Introduction to building materials, Brick: Raw materials, drying & burning, Strength & durability, mortar for masonry & strength of masonry, Timber, Seasoning & conversions, p9roperties, tests, defects in timbers, Glass: Chemical compositions, mechanical & optical properties, Various types of glasses, Strengthening of glasses, Metals, steel for reinforced concrete & prestressed concrete construction, structural steel sections, Deterioration of building materials.

Text/Reference Books

1. Civil Engineering Materials. Somayaji S. Prentice Hall, New Jersey.2001.
2. Concrete Technology. Neville A. M. & Brooks J. J. 4th Indian reprint. Pearson Education. 2004.
3. Concrete Technology. Shetty M. S. S. Chand & Company Ltd. 2005.

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Semester - III

(Departmental Core Subject)

CE-254   L-T-P-C
Fluid Mechanics   3-0-1-4

Objective: *The aim of this course is to introduce & explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Civil Engineering, Gas dynamics etc. This course will also help to learn fluid properties & hydrostatic law & to understand the importance of flow measurement & its applications in industries.*

Course Content

Fluid properties; Pressure measurement; Hydrostatic forces on plane & curved surfaces; Buoyancy & equilibrium; Stability, metacentric height; Types of flow; Continuity; Energy & momentum equations; Velocity distribution & velocity coefficients, practical applications; Navier Stoke equation; Shear stress & pressure gradient; Flow through pipes, Hagen-Poiseuille equation; Turbulence, Prandtl's mixing length, eddy viscosity; Darcy-Weisbach equation for flow through pipes, friction factor, Moody diagram, minor losses, pipes in series & parallel, equivalent length, pipe network analysis; Water hammer; Boundary layer concept, drag coefficients, control of boundary layer; Dimensional analysis & similitude.

List of Experiments

1. Measurement of fluid pressure using various manometers & gauges
2. Experimental study on capillarity
3. Determination of coefficient of viscosity of a fluid using viscometer
4. Experimental study on stability of floating bodies

5. Experiments on fluid pressure distribution on immersed bodies

6. Different types of flow using Reynold's apparatus

7. Determination of friction factor in pipes using pipe friction apparatus

8. Experiments on flow nets using Hele-Shaw apparatus

9. Experiments on cavitations

10. Flow behavior in open channels using tilting flume

Text/Reference Books
1. Hydraulics & Fluid Mechanics. Modi P.N. & Seth S.M. Standard Book House. 1998.
2. Fluid Mechanics. Streeter V.L. & Wylie E.B. McGraw Hill. 1997.
3. Fluid Mechanics. B.F. White. McGraw Hill.1994.

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Semester - III

(Humanities & Basic Sciences Subject)

HU-251   L-T-P-C
Business & Technical Communication   1-1-0-2

Objective: *To develop persuasive & professional communicative competence*

Course Content

Presentation Skills: Types of presentation; Effective strategies for oral presentations - audience analysis; organizing contents & use of media; Awareness of body language, time & space; Tone, variety of pitch, rate, volume & Articulation.

Letter Writing: Essentials of an effective business letter, Types of business letters: Sales Letter, Complaint Letter, Claim & Adjustment Letters.

Technical Report Writing: Characteristics & structure of a formal report; Classification & types of reports; Organization, Analysis & Interpretation of data; Revising & Editing especially in areas like abstracting/ summarizing as well as citations, references & bibliographies, check list for reports.

Text/Reference Books
1. How to Prepare, Stage & Deliver Winning Presentations. Leech T. 2nd Ed. Prentice Hall. 2004.
2. Business Communication Today. Boove C & Thill J. 11th Ed. Prentice Hall. 2011.
3. Effective Technical Communication. Rizvi A. 11th Ed. Tata McGraw-Hill Publishing Company Ltd. 2005.

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Semester - III

(Humanities & Basic Sciences Subject)

MA-251   L-T-P-C
Mathematics - III   3-1-0-4

Objective*: In this course the student is familiarized with some important Mathematical techniques used in various branches engineering.*

Course Content

Ordinary Differential Equations: higher-order linear differential equations with variable coefficients, method of variation of parameters, operator method; series solutions of linear differential equations, Legendre equation & Legendre polynomials, Bessel equation & Bessel functions of first & second kinds; systems of first-order equations, phase plane, critical points, stability. Numerical solutions of IVP - Difference equations, stability, error & convergence analysis. Single step methods - Taylor's series method, Euler's method, Picard's method of successive approximation, RungeKutta Method. Multi step methods - Predictor-Corrector method, Euler PC method, Milne & Adams Moulton PC method.

Partial Differential Equations: First order partial differential equations; solutions of linear & nonlinear first order PDEs; classification of second-order PDEs; method of characteristics; boundary & initial value problems (Dirichlet & Neumann type) involving wave equation, heat conduction equation, Laplace's equations & solutions by method of separation of variables (Cartesian coordinates); initial boundary value problems in non-rectangular coordinates.

Text/Reference Books

1. Higher Engineering Mathematics. Ramana B.V. 1st Ed. Tata McGraw-Hill Education. 2006.
2. Elements of Partial Differential Equations. Sneddon I.N. McGraw Hill.1957.
3. Differential Equations. Ross S. L. 3rd Ed. Wiley .1984.
4. Elementary Applied Partial Differential equations with Fourier Series & Boundary Value Problem. Haberman R. 4th Ed. PH. 1998.
5. Applied Numerical Analysis. Gerald C. F. & Wheatley P. O. 6th Ed., Wesley.1999.
6. Elementary Differential Equations & Boundary Value Problems. Boyce W. E. & DiPrima R.C. 9th Ed. Wiley. 2009.
7. An Introduction to Ordinary Differential Equations. Codington E. A. 2nd Ed. PHI. 1995.

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Semester - IV

(Departmental Core Subject)

CE-255   L-T-P-C
Surveying - I   3-0-1-4

Objective: *To impart the knowledge of basics of surveying used in design of various infrastructures like highways, railroads, bridges, tunnels, buildings & utilities.*

Course Content

Introduction to surveying; linear measurements; chain surveying; compass surveying; accuracy; precision & errors; leveling; plane table; contouring, theodolite surveying.

List of Experiments

1. Ranging & chaining
2. Chain & cross staff survey
3. Compass survey
4. Level by collimation plane method & rise & fall method
5. L-section of road with Dumpy Level
6. Theodolite traversing
7. Area of irregular figure by using Planimeter
8. Plain table traversing two point problem
9. Contouring

Text/Reference Books
1. Surveying & Leveling, Vol-I &Vol-II. Kanetkar T.P. &Kulkarni S.V. Pune Vidyarthi Griha Prakshan. 1972.
2. Surveying, Vol-I &Vol-II. Punmia B.C. & Jain A.K. Laxmi Publication Pvt. 1996.
3. Remote Sensing & Image Interpretation. Lillesand T.M. & Kiefer R.W. John Wiley & Sons. 1994.

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Semester - IV

(Departmental Core Subject)

CE-256   L-T-P-C
Construction Technology & Management   3-0-0-3

Objective: *This course will cover the fundamentals of Construction Technology, Construction Management & keep abreast of new technologies in Construction Technology & Management. This course will help students to enhance the understanding of Project Management techniques.*

Course Content

Construction as industry & its challenges, Role of construction management, Methods of construction managements, Basic requirements of construction management: Learning structures, Life cycle of construction projects: Examples of real projects & its learning requirements, Stages of awarding contract, types of contract, contract documents, arbitration & settlement of disputes, contract laws & handling of contracts, commissioning of project, Principles of estimation, Principles of general & detailed specifications, Introduction to network based project management techniques: Defining activities & their interdependence, drawing of network, time & resource estimations, use of network as scheduling techniques, use of network as control techniques i.e. project monitoring, Construction Technology: construction of superstructure & substructures, Various construction methods: Excavation, Earthmoving, Drilling, Blasting, Dewatering, foundation, Finishing items, painting, flooring, brick works. Examples of construction of structures such as buildings, bridges, roads, tunnels, industrial structures, Quality

Management & Construction safety, Use of information technology in construction industries, Automation in construction industry: a general discussion.

Text/Reference Books

1. Modern Construction Management. Harris F., McCaffer R. & Edum-Fotwe F. Blackwell Publishing. 2006.
2. Construction Management Fundamentals. Schexnayder C.J. & Mayo R.E. McGraw Hill. New Delhi. 2003.
3. Construction planning & equipment. Peurifoy R.L. & Schexnayder C.J. 6th Ed. Tata-McGraw Hill. 2006.

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Semester - IV

(Departmental Core Subject)

CE-257   L-T-P-C
Structural Analysis - I   3-1-0-4

Objective: *The course is useful in understanding of the basic fundamentals of structural analysis including the analysis of various determinate trusses, force method of analysis of structures, calculation of deflection in beams by various methods etc. The course is also useful in understanding the concept of analysis of indeterminate structures by various classical methods.*

Course Content

Different types of structures, Loads on the structural system, static & kinematic indeterminacy, Methods of Analysis: Equilibrium equations, compatibility requirements, Introduction to force & displacement methods, Analysis of trusses: plane truss, compound truss, complex truss & space truss, Arches & suspension cables, three hinged arches & suspension cables, Deflection of Beams, various methods for calculation of deflection, Analysis of indeterminate structures by force methods, flexibility coefficients, Energy methods: Principle of minimum potential energy, principle of virtual work, Castigliano's theorems, Reciprocal theorem, unit load method, Influence line & Rolling loads, beam, frames & arches, Muller Breslau Principles & its applications to determinate & indeterminate structures

Text/Reference Books
1. Basic Structural Analysis. Reddy C.S. 2nd Ed. Tata McGraw Hill. 2006.
2. Structural Analysis. Hibbeler R.C., Sixth Ed. Pearson Education. 2009.
3. Structural Analysis. Negi L.S. & Jangid R.S. Tata McGraw Hill, New Delhi. 1997.

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Semester - IV

(Departmental Core Subject)

CE-258   L-T-P-C
Building Planning, Construction & Drawing   3-0-1-4

Objective: *The course is designed to ensure that students can understand & prepare the detailed working drawing for doors, windows, etc. The course covers the knowledge of principles of planning, bylaws, drawing plan, elevation & section of load bearing, framed & industrial structure.*

Course Content

Functional planning of buildings; Masonry; Prevention of dampness; Different openings in buildings; Floorings & roofs; Vertical transportation in buildings.

List of Experiments

1. Understanding of conventional signs & symbols
2. Building components: bonds & brickwork, doors, staircases, simple foundations
3. Site & building planning: site plans, simple one-bedroom house, two-storied house, multi-storied apartment building
4. Planning & layout of large scale commercial facilities
5. Auto-CAD drafting

Text/Reference Books
1. Building Construction. Varghese P.C. PHI Learning Pvt. Ltd. 2008.
2. Building Construction. Punmia B.C. & Jain A.J. Laxmi Publications. 2005.
3. Building Drawing & Detailing. Balagopal T.S., Prabhu K., Vincent Paul & Vijayan C. Spades Publishers. Calicut. 1987.

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Semester - IV

(Departmental Core Subject)

CE-259   L-T-P-C
Hydraulics & Hydraulic Structures   3-0-1-4

Objective: *The aim of this course is to understand various parameters involved in designing of open channel & to learn about critical flow, non-uniform flows. Longitudinal slopes in open channel. It also aims at understanding the working principles of hydraulic machinery turbines, pumps, canals, etc.*

Course Content

Open channel hydraulics, uniform flow, critical flow, gradually varied flow, hydraulic jump, unsteady flow; Introduction to pumps & turbines; Channel design, erodible &non-erodible channels, silt theories, sediment transport; Introduction to river engineering, meandering & river training works.

List of Experiments

1. Determination of resistance coefficient in open channels
2. Experiments on variation of specific energy with depth of flow in open channels
3. Measurement of flow using weirs & notches
4. Measurement of flow using a Parshall flume
5. Experiments on gradually varied flow (GVF) in open channel
6. Experiments on hydraulic jumps
7. Experiments on centrifugal & reciprocating pumps
8. Experiments on impulse & reaction turbines

Text/Reference Books

1. Irrigation Engineering & Hydraulic Structures, Garg S.K. Khanna Publishers. 1992.
2. Open Channel Flow. Chow V.T. McGraw Hill. 1975.
3. Flow in Open Channels. Subramanya K. Tata McGraw Hill. 1998.
4. Fluid Mechanics. White B.F. McGraw Hill. 1994.

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Semester-V

(Departmental Core Subject)

CE-351   L-T-P-C
Structural Analysis - II   3-1-0-4

Objective: *This course is useful in understanding the behavior of indeterminate structures & analysis the indeterminate structures using stiffness methods. The course contains the study the multi storey frames subjected to gravity loads & lateral loads. This course gives the understanding of the concepts of matrix analysis of structures.*

Course Content

Classical method of analysis of framed Structures: Slope deflection method, Moments distribution methods, effect of symmetry &anti-symmetry, sway correction, Approximate methods: Substitute frame methods for gravity load, Lateral load analysis: Portal & Cantilever methods, Matrix method of structural analysis: Stiffness method: Local & global stiffness matrices, assembly, band storage, solution of resulting simultaneous algebraic equation, boundary conditions, application to plane & space truss, analysis of plane frame, grid & three dimensional frame.

Text/Reference Books
1. Matrix analysis of framed structures. Weaver W & Gere J.M. 2nd Ed. CBS Publishers. 2004.
2. Intermediate Structural Analysis. Wang C.K. Tata McGraw Hill. 1984.
3. Basic Structural Analysis. Reddy S. 2nd Ed. Tata McGraw Hill. 2005.
4. Structural Analysis - A matrix approach. Pandit G.S. & Gupta S.P.2nd ed.Tata McGraw Hill. 2008.
5. Elementary Structural Analysis. Norris C.H. Wilbur J.B. Utku S. 4th Ed. Tata McGraw Hill. 2003.
6. Matrix Methods of Structural Analysis. Kanchi M.B. Enlarged Ed. Wiley Eastern Limited. 1993.

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Semester - V

(Departmental Core Subject)

CE-352   L-T-P-C
Geotechnical Engineering - I   3-0-1-4

Objective: *This course will impart the fundamental concepts of soil mechanics .The course covers the identification & classification of soil. The course designed to understand the importance of index properties like grain size, consistency limits & the concept of effective stress & shear strength of soil.*

Course Content

Origin of soil, Phase relationships, Identification & classification of soils, Effective stress principle, Permeability of soils, Compressibility of soils, Seepage & flownets, Terzaghi's one-dimensional consolidation theory, Shear strength of soils, Effective stress & total stress strength parameters, Total & effective stress paths, Compaction of soils.

List of Experiments

1. Specific gravity test
2. Sieve analysis
3. Hydrometer analysis
4. Atterberg limits
5. Classification of soil
6. Compaction test
7. Permeability test
8. Relative density test
9. Field density test

Text/Reference Books

1. Basic & Applied Soil Mechanics. Ranjan G. & Rao A. S. R, New Age International. 2000.
2. Soil Mechanics in Engineering Practice. Terzaghi K. Peck R.B. & Mesri G. John Wiley & Sons. 1996.
3. Design Aids in Soil Mechanics & Foundation Engineering.Kaniraj S.R.Tata McGraw Hill.1988.
4. Soil Mechanics. Lambe T.W. & Whitman R.V. John Wiley & Sons. 1969.
5. Soil mechanics laboratory testing. Boca Raton, Fratta D., Aguettant J. & Roussel Smith L.CRC Press. USA. 2007.

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Semester - V

(Departmental Core Subject)

CE-353   L-T-P-C
Reinforced Concrete Design   3-1-0-4

Objective: *To study the stress strain behavior of steel & concrete; to understand the concept of working stress & limit state methods; to gain the knowledge of limit state design for flexure, shear, torsion, bond & anchorage; to understand the behavior of columns subjected to eccentric load & use of interaction diagrams & to study the design of various foundations.*

Course Content

Working stress & limit state method of design of R.C. Structures, Design of Beam: Singly reinforced, Doubly reinforced beam, Flanged beam, Shear & bond, development length, detailing of reinforcement, Torsion, Serviceability criteria: Deflection, Design of Slab: One way & two way slab, detailing, redistribution of moments, Design of Column: Axial loading, Uniaxial bending, Biaxial bending, Slender column, Foundation: Isolated& Combined footing.

Text/Reference Books

1. Reinforced Concrete Design. Pillai S.U. & Menon D. 3rd Ed. Tata McGraw-Hill. 2009.
2. Limit State Design of Reinforced Concrete. Varghese P.C. Prentice Hall India. 2008.
3. Reinforced Concrete Design, Sinha S.N. 2nd Ed. Tata McGraw-Hill. 2002.
4. Fundamentals of Reinforced Concrete Design. Gambhir M.L. Prentice Hall India. 2006.
5. Reinforced concrete: Limit state design. Jain A.K. Nem Chand & Bros. 1999.

6. Reinforced Concrete: Mechanics & Design Macgregor J. & Wight J.K. 5th Ed. Prentice Hall. 2008.

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Semester -V

(Departmental Core Subject)

CE-354   L-T-P-C
Concrete Technology   3-0-1-4

Objective: *The objectives of this course are to deliver knowledge of the types of cement, mineral, chemical admixtures & aggregates. This course helps in understanding the methodology of mix design, special concrete & their use.*

Course Content

Cement: Chemical composition, manufacturing, physical characteristics, hydration, properties of cement compounds, different types of cements, Aggregate: Coarse & fine aggregates, Influence of aggregate on the properties of concrete, aggregate selection.

Fresh Concrete: Batching, Mixing, workability, effect of admixture, Hardened Concrete: mechanical properties of hardened concrete, Water cement ratio, Porosity, Curing of concrete, High performance concrete, Design of concrete mix: IS code recommendation, British code & ACI code,

Corrosion, chloride & sulphate attack on concrete, alkali-aggregate reaction, acid aggregate reactions.

List of Experiments

1. Physical tests on cement
2. Test on fine & coarse aggregates
3. Tests for workability on concrete
4. Tests on hardened concrete: compression tests on cubes & cylinders, modulus of rupture test, rebound hammer & UPV test
5. Concrete mix design by Indian Standard Method

6. Testing of bricks: efflorescence, water absorption & compressive strength
7. Testing of reinforcement bar in tension

Text/Reference Books
1. Civil Engineering Materials. Somayaji.S. Prentice Hall. New Jersey. 2001.
2. Materials for Civil & Construction Engineers. Mamlouk M.S. & Zaniewski J.P. 2nd Ed. Pearson. Prentice Hall. 2006.
3. Concrete Technology. Shetty M. S. S. Chand & Company Ltd. 2005.
4. Concrete Technology. Neville A.M. & Brooks J.J. Fourth Indian reprint. Pearson Education 2004.
5. Civil Engineering materials. Jackson N & Dhir R.K. 4th Ed. Macmillan 1997.
6. Introduction to Material science for Engineers. Shackelford F. & Muralidhara M.K. 6th Ed. Pearson Education. 2007.

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Semester - V

(Departmental Core Subject)

CE-355   L-T-P-C
Hydrology   3-1-0-4

Objective: *To understand the hydrological parameters, its impact on the design of hydraulic structures, modeling of hydrological phenomenon's & creates the background for the study of the design of hydraulic structures.*

Course Content

Surface water hydrology - hydrologic cycle, rainfall & its measurement, mean rainfall, runoff; Flow measurements; Infiltration losses; Storm hydrology; Unit Hydrograph; Storm hydrograph; Reservoir planning - Investigations, life of reservoir; Flood estimation & routing, flood forecasting; Surface & sub-surface drainage, water logging, remedial measures, drainage of land; Ground water hydrology - Introduction, types of aquifers, wells, well yield.

Text/Reference Books
1. Applied Hydrology. Chow V.T. Maidment D.R. & Mays L.W. McGraw Hill. 1998.
2. Elementary Hydrology. Singh V.P. Prentice Hall. 1993.
3. Hydrology - Principles. Analysis & Design. Raghunath H.M. Wiley Eastern Ltd.1986.
4. Irrigation - Theory & Practice. Michael A.M. Vikas Publishing House. 1987.
5. Groundwater Hydrology. Todd D.K. John Wiley & Sons. 1993.
6. Water Resources Engineering. Linsley K. McGraw Hill. 1995.
7. Irrigation Engineering & Hydraulic Structures. Garg S.K. Khanna Publishers. 1992.

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Semester - V

(Departmental Core Subject)

CE-356   L-T-P-C
Surveying - II   3-0-1-4

Objective: *To learn about tachometry, geodetic surveying & satellite surveying. To get introduced to different geodetic methods of survey such as triangulation, trigonometric leveling & advanced surveying techniques such as remote sensing, total station, GPS, photogrammetry, etc.*

Course Content

Tacheomatric survey; trigonometrical surveying; triangulation; curves; advanced survey instruments; Electronic Distance Measurement, Total station & Global Positioning System, Introduction to photogram-metry& remote sensing.

List of Experiments

1. Additive &multiplying constants of given tacheometer
2. Elevation of points & horizontal distance between them by tacheometric survey
3. Determination of area by tacheometric survey
4. Trignometric levelling
5. Determination of horizontal distance between two inaccessible points with theodolite
6. Setting out simple curve - offset from chord method
7. Setting out simple curve - Rankine method of tangential angle
8. Demonstration - EDM instruments & use of total station

Text/Reference Books

1. Surveying & Levelling. Vol-I & Vol-II. Kanetkar T.P & Kulkarni S.V. Pune Vidyarthi Griha Prakshan. 1972.
2. Surveying. Vol-I & Vol-II. Punmia B.C., Jain A.K. Laxmi Publication Pvt. 1996.
3. Remote Sensing & Image Interpretation. Lillesand T.M & Kiefer R.W. John Wiley & Sons. 1994.
4. Fundamentals of Remote Sensing. Joseph G. Universities Press. 2003.

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Semester - VI

(Departmental Core Subject)

CE-357   L-T-P-C
Transportation Engineering - I   3-0-1-4

Objective: *This course is design to impart the knowledge in highway engineering, railway engineering, highway geometrics, materials, construction & design.*

Course Content

Introduction to Transportation Engineering; Vehicle & driver characteristics; Pavement materials & characterization; Pavement analysis & design: Flexible pavements, Rigid pavements; Geometric design of Highways: Cross sectional elements, Horizontal alignment, Vertical alignment; Evaluation of Transportation Improvement; Terminology used in railways; Track design; Points & crossings; Capacity of Railway transit systems.

List of Experiments

1. Evaluation of road aggregate for various properties:
   1.1. Sieve analysis
   1.2. Los-Angeles abrasion test
   1.3. Flakiness & elongation index
   1.4. Impact test
   1.5. Crushing test
   1.6. Water absorption & specific gravity test
2. Evaluation of bitumen for various properties:
   2.1. Softening point test
   2.2. Penetration test
   2.3. Viscosity test

2.4. Ductility test

2.5. Stripping test

3. Bitumen mix design- Marshall mix design method

Text/Reference Books
1. Principles of Transportation Engineering. Chakroborty P. & Das A. Prentice Hall India. 2003.
2. A text book of Railway Engineering. Saxena S.C. & Arora S.P. Dhanpat Rai. 2001.
3. Highway Engineering. Khanna S.K. & Justo C.E.G. Nem Chand Bros. 2002.
4. Pavement Analysis & Design. Huang Y. H. Pearson Education, India. 2008.
5. IS Codes & IRC Codes
6. Highway materials: Soil & Concrete. Harold N.A. Prentice Hall, 2004.

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Semester - VI

(Departmental Core Subject)

CE-358   L-T-P-C
Environmental Engineering - I   3-0-1-4

Objective: *To learn about the water demand computation, characteristic of water & waste water, sewer design & environmental chemistry. To understand the role of microbiology in water & waste water engineering.*

Course Content

Introduction, Population Forecasting & Water Demand, Physical, Chemical & Biological Characteristics of Water & Wastewater, Wastewater Flow, Sewerage system & sewer design, Basic Microbiology: cells, classification & characteristics of living organisms. Metabolic Processes, Microorganisms in Natural Water Systems, Biological Oxidation of Organic Matter. Introduction to Environmental Chemistry, Stoichiometry & Kinetics of Chemical Reactions, Equilibrium Constant & Solubility Products, pH & Alkalinity. Development of Oxygen Sag Model. Flow sheets for Water & Wastewater Treatment, Introduction to Solid Waste, Air Pollution & Noise Pollution.

List of Experiments

1. Solid analysis
2. Measurement of pH
3. Measurement of alkalinity
4. Measurement of turbidity
5. Measurement of conductivity
6. Estimation of hardness
7. Determination of dissolved oxygen (DO).

8. Measurement of BOD of wastewater

9. Measurement of COD of wastewater

10. Jar test for optimum coagulant dose.

Text/Reference Books
1. Environmental Engineering. Peavy H. S., Rowe D. R. & T chobanoglous G. McGraw-Hill International Ed. 1985.
2. Water Supply & Sewerage. McGhee T. J. McGraw-Hill. 1991.
3. Manual for Sewer & Sewerage, Central Public Health & Environmental Engineering Organisation, Ministry of Housing & Urban Development, Govt. of India, 1993.
4. Manual for water supply & treatment, Central Public Health & Environmental Engineering Organisation, Ministry of Housing & Urban Development, Govt. of India, 1999.

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Semester - VI

(Departmental Core Subject)

CE-359   L-T-P-C
Design of Steel Structures   3-1-0-4

Objective: *To learn IS 800-2007 code of practice for the design of compression, tension & flexural members using various cross-sections; to study the behavior & design of compression & tension members using simple & built-up sections.*

Course Content

Steel structures - advantages, design loads, structural steel sections, material properties, Codes & Specifications: IS 800, 2007, Design Concepts: Working stress design, limit state design, plastic design, LRFD. Classification of sections, Forms of constructions, Design of connections, types of connections, Bolt connections: ordinary black bolts, HSFG bolts & their design in shear, bearing, bending, tension; prying force, slip resistance, block shear failure. Welded connections: different types of weld connections & design, detailing of connections. Design of eccentric connections, Design of tension members: design criteria, net & gross area, examples, Design of compression members: concept of stability & buckling, failure modes, effective lengths, local & global buckling, design of compression members of various types. Design of flexural members: moment curvature relations, stability & lateral-torsional buckling, design against shear, serviceability requirements, beam column design. Design of base plates, load transfer mechanism, design of slab base, gusseted base & anchorage. Steel structural systems.

Text/Reference Books
1. Design of Steel Structures. Subramanian N. Oxford University Press. 2008.

2. Design of Steel Structures. Negi L. S. Tata McGraw Hill. 1997.
3. Design of Steel Structures. Edwin M., Gaylord J. & Stallmeyer J. E. McGraw-Hill. 1991.
4. Design of Steel Structures. Dayaratnam P. S. Chand & Co. 2003.

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Semester - VI

(Departmental Core Subject)

CE-360   L-T-P-C
Water Resources Engineering   3-1-0-4

Objective: *This course will help the students understand the necessity & importance of irrigation, factors affecting frequency & efficiency of irrigation. They will also study canal distribution networks, design of different diversion head works, canal structures & cross drainage works, gravity dams, earthen dams & spillways.*

Course Content

Soil-Water-Plant relationships, crop water requirement; Layout of canal system; Types & methods of irrigation. Introduction to Dam engineering, classification of Dams, design of spillway; Basic principle of design of hydraulic structures; Cross drainage works

Text/Reference Books

1. Applied Hydrology. Chow V.T. & Maidment D.R. McGraw Hill. 1998.
2. Elementary Hydrology. Singh V.P. Prentice Hall. 1993.
3. Hydrology - Principles, Analysis & Design. Raghunath H.M. Wiley Eastern Ltd. 1986.
4. Irrigation Engineering & Hydraulic Structures. Garg S.K. Khanna Publishers. 1992.

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Semester - VI

(Departmental Core Subject)

CE-361   L-T-P-C
Geotechnical Engineering - II   3-1-1-5

Objective: *This course is design to understand the importance of earth pressure theory in design & analysis of retaining walls, sheet piles & bulk heads. The course will also be useful in understanding the concepts of bearing capacity, pile foundation & analysis of the pile & pile group under various soil conditions.*

Course Content

Types of retaining walls, Earth pressure theories, Sheet piles & bulkheads; Shallow foundations: Terzaghi's bearing capacity theory, Stress distribution, Immediate & consolidation settlement; Deep foundations: Load carrying capacity of piles, Settlement of pile groups; Foundation types, selection & design; Stability of slopes, Site investigation & subsoil exploration.

List of Experiments

1. Direct shear test
2. Vane shear test
3. Unconfined compression test
4. Triaxial compression tests: unconsolidated undrained, consolidated undrained, consolidated drained.
5. Consolidation test.
6. Standard penetration test.

Text/Reference Books
1. Basic & Applied Soil Mechanics. Ranjan G. & Rao A.S.R. New Age International. 2000.
2. Foundation Analysis & Design. Bowles J.E. McGraw Hill. 1996.
3. Design Aids in Soil Mechanics & Foundation Engineering. Kaniraj S.R. Tata McGraw Hill. 1988.
4. Design of Foundation Systems: Principles & Practices. Kurian P.N. Narosa. 1994

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Semester - VII

(Departmental Core Subject)

CE-451   L-T-P-C
Transportation Engineering-II   3-0-1-4

Objective: *This course is aimed at understanding the traffic characteristics, design of intersections & other Traffic facilities. The course will also be useful for planning & components of airport & harbor.*

Course Content

Traffic flow fundamentals; Uninterrupted Traffic flow: Traffic stream characteristics, Traffic flow models, capacity & LOS analysis; Interrupted Traffic flow: Traffic flow at signalized & unsignalized intersections; Design of Traffic facilities: Highways, intersection, interchanges; Transportation planning; Introduction to planning; Travel demand forecasting: Four step planning, Advance methods for travel demand forecasting; Airport related Terminology; Airport configuration; Geometric design of runway; Air travel demand forecasting; Harbor related Terminology; Traffic forecasting & hinterland; Harbor layout.

List of Experiments

1. Traffic volume count by manual method
2. Speed studies
3. Headway studies in various condition
4. Speed-volume studies by moving observer method
5. O-D studies
6. Parking studies
7. Acceleration noise studies

8. Vision testing

Text/Reference Books

1. Transportation Engineering & Planning. Papacostas C.S. & Prevedouros P.D. Prentice Hall India. 2001.
2. Planning & design of airports. Horonjeff R. & McKelvey F.X. McGraw-Hill. 1994.
3. Principles of Transportation Engineering. Chakroborty P. & Das A. Prentice Hall India. 2003.
4. Traffic Engineering. Roess R.P. McShane W.R. & E.S. Prassas. Prentice Hall. 1990.
5. Dock & Harbor Engineering. Oza H.P. & Oza G.H. Chorotar. 4th Ed. 1999.

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Semester - VII

(Departmental Core Subject)

CE-452   L-T-P-C
Environmental Engineering - II   3-0-0-3

Objective: *To learn about the design of water treatment plant & its various components. It also helps to have deep insight of various treatment methods given to waste water generated from domestic & industrial areas.*

Course Content

Particle Fluid Mechanics as applied to the settling of Type I & II suspensions. Design & operation of Sedimentation Tanks. Coagulation and Flocculation. Hydraulics of Filtration, Design & Operation of Filter Units. Disinfection Methods. Ion exchange & Adsorption. Water Softening, Manganese & Iron Removal. Wastewater Treatment - Preliminary, Primary & Secondary Treatment Units. Aerobic & Anaerobic Processes. Purpose, theory & design of aeration units. Sludge treatment & disposal, Wastewater stabilization ponds, Aerated ponds & Oxidation ditches. Site-visits to Water &Wastewater Treatment Works.

Text/Reference Books
1. Environmental Engineering. Peavy H.S., Rowe D. R & G. Tchobanoglous. McGraw-Hill International Ed.1985.
2. Wastewater Engineering- Treatment & Reuse. Metcalf & Eddy. 4th Ed. Tata McGraw Hill. 2004.
3. Water Supply & Sewerage. McGhee T. J. McGraw-Hill Inc.1991.
4. Water Treatment Principles & Design. Montgomery J. M. John Wiley & Sons.1985.
5. Introduction to Environmental Engineering. Davis M. L &Cornwell D. A. McGraw-Hill Inc.1991.
6. Wastewater Treatment for Pollution Control & Reuse. Arceivala S. J & Asolekar S. R. Tata McGraw Hill. 2006.

7. Manual for Sewer & Sewerage. Central Public Health & Environmental Engineering Organisation. Ministry of Housing &Urban Development. Govt. of India. 1993.
8. Manual for water supply & treatment. Central Public Health & Environmental Engineering Organisation. Ministry of Housing &Urban Development. Govt. of India. 1999.

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Semester - VII

(Departmental Core Subject)

CE-453   **L-T-P-C**

Estimation & Costing   **3-1-0-4**

Objective: *This course covers the importance of preparing the types of estimates under different conditions. The course is designed to educate participant about the rate analysis, bill preparations & specification writings. This course ensures that a student can understand the valuation of land & buildings.*

Course Content

Estimation:- Objectives -Process components - Basic Principles of measurement - Units of measurement - Quantification of various items of construction - Illustrative examples for different types of structures - Reinforcement bar bending & bar requirement schedules - Principles of rate analysis - Standard data & schedule of rates approximate estimates, valuation.

Text/Reference Books
1. Construction Estimating Techniques. Harde G. M. Prentice Hill Inc. Englewood Cliffs, New Jersey. 1986.
2. Estimating & Costing in Civil Engineering Theory & Practice. Dutta B.N. UBS Publishers & Distributors Limited New Delhi. 1996.
3. Estimating, Costing, Specification & Valuation on Civil Engineering. Chakrabrti M. Calcutta. 2002.
4. IS: 1200 - 1974- Parts 1 to 25, Methods of Measurement of Building &Civil Engineering Works. Bureau of Indian Standards. New Delhi
5. Standard Data Books of Central Public works Departments & Public Work Department of States.

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Semester - VII

(Departmental Core Subject)

CE-471   L-T-P-C
Computer Application in Civil Engineering   0-0-3-3

Objective: *This course discusses about the basic theory of structure & structural analysis for static condition.*

List of Experiments

1. Analysis and design of structures: Simply supported beam, Cantilever beam and Propped cantilever beam, Continuous beam, Portal frame: Non sway frame, Sway frame

2. Analysis and design of trusses

3. King post truss

4. Queen Post truss

5. Howe truss

6. Analysis and design of residential building (Gravity loading)

7. Analysis of bar element: Bar of uniform section, Bar of non-uniform section

Text/References Books
1. Analysis & Design of Structures Kindle Ed. by Trevor Jones.
2. Illustrated Design of Reinforced Concrete Buildings (GF+3storeyed). V.L. Shah & S.R. Karve- Structures Publications.

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Semester - VII

(Departmental Core Subject)

CE-450   L-T-P-C
Industrial Internship   0-0-0-3

Summer Internships offer students personal & real world spirits & exposes to an actual working life, an experiential foundation to their career choices & the chance to build valuable business networks. Under this programme each student undergoes training in an Industry for a minimum period of six weeks during the summer vacation after VI Semester. Through the internship students are exposed with the various processes involved at any typical industrial unit such as, operating procedure, construction processes, management procedures etc. & have the opportunity to relate with the knowledge they acquired in the classroom. Students execute a small project based on any of the above mentioned aspects under the supervision of competent personnel in the industry & a faculty member of the university.

After completion of the Internship, students are required to prepare a report, based on the activities performed during the internship, as per the prescribed format/ guidelines. The report should be certified by the Supervisors, & presented in the form of a seminar in the VII Semester.

Evaluation of the Summer Internship will be done as per the approved procedure.

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Semester - VII

(Departmental Core Subject)

CE-455   L-T-P-C
Comprehensive Viva voce   0-0-0-2

The knowledge gained by the students during their B.Tech. programme will be evaluated through a Comprehensive Viva Voce Test in the VII Semester. The test will cover the entire syllabi of the B.Tech. Degree programme. Preparation for the Comprehensive Viva Voce Test will also help the students in their placement activities. The evaluation will be done as per the approved procedure.

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Semester - VII

(Departmental Core Subject)

CE-460   L-T-P-C
Minor Project   0-0-3-3

Students undertake project work to develop the skill & aptitude of problem-solving. The project work is divided into two parts: Minor & Major. The Minor project is to be undertaken in the VII Semester.

Students will choose an area of their interest in consultation with a faculty member of the department, who will act as the Supervisor. The area of interest could be confined to his/her discipline or may be interdisciplinary.

The project work will involve all or some of the following processes: identification of problem, study of related literature, data collection & analysis, theoretical formulation, fabrication, experimentation & result analysis.

The preliminary work such as problem identification through literature survey, field survey etc. & preparation of plan of execution should be complied in the form of a report, in the prescribed format/ guidelines. The report, duly certified by the Supervisor, should be submitted to the Head of the Department.

Progress made by students will be continuously monitored & evaluated as per the approved procedure.

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in
All Disciplines

Semester - VII

(Humanities & Basic Sciences Subject)

HU-451   L-T-P-C
Interview Skills   0-0-1-1

Objective: *To understand the intricacies of interview & develop skills to perform satisfactorily.*

Course Content

SWOT Analysis.

Significance of Etiquette, Grooming, Kinesics, Paralanguage & Proxemics in interviews.

Résumé, Cover letter, Thank you Letter, Job Acceptance Letter.

Interview types, Open-ended, Behavioural & Hypothetical questions, FAQs.

Group Discussion & Interview sessions.

Text/Reference Books
1. How to Succeed in Group Discussions & Personal Interviews. Mandal S. Jaico Publishers. 2004.
2. Cover Letters. Fein R. Jaico Publishers. 2005.
3. The Definitive Book of Body Language. Barbara P. Manjul Publishing House Pvt. Ltd. 2013.

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Semester - VII

(Humanities & Basic Sciences Subjects)

MA-454   L-T-P-C
Quantitative Aptitude   0-1- 0 -1

Objective: *To introduce certain topics from quantitative aptitude with emphasis on analytical ability & computational skills needed in competitive examinations. This module would also train the students to solve quantitative aptitude problems during the placement drives.*

Course Content

Problems on Alligation or mixture.

Problems on Ages.

Problems on Clock.

Problems on Calendar.

Problems on Speed, Time & distance.

Problems on Time & Work.

Problems on Heights & distances.

Problems on Trains.

Problems on Boats & Streams.

Problems on Pipes & Cisterns.

Text/Reference Books
1. Quantitative Aptitude. Aggarwal R. S. S. Chand. 2012.
2. Quantitative Aptitude. Trishna Knowledge Systems. Pearson. 2014.

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Semester-VII

(Management Subject)

BM-451   L-T-P-C
Ethics & IPR   2-0-0-2

Objective: *The aim of this course is to sensitize students towards professional ethics, values, & associated aspects. It initially addresses concerns relating to product & service quality & then moves on to ethical aspects of organizational functioning. The course throws light on ethical issues & crimes that are likely to remain at the core of corporate concerns & discusses intellectual property related issues that are the need of modern industrial & business enterprises.*

Course Content

Role of Corporations: Some big changes in the world in last 60 years (WW II, GATT, WTO) & impact on business, Need for strategic planning & process management, Business strategies & challenges in leading global organizations.

Quality Management: Quality as a strategic imperative, Evolution of quality management, Distinction between quality control, quality assurance & quality management, International standards (ISO family of standards) & International models for quality management, quality in services, enhanced focus on accreditation, the accreditation process, standards for key services (food processing: HACCP & education: NAAC).

Ethics & Human Values: Ethics & morals values, Ethical theories, Common features of unethical companies & leaders, Professional ethics, Professional Codes of Ethics, Benefits & limitations of code of ethics, Corporate social responsibility & its business implications.

Intellectual Property Issues: Protecting the intangible, Evolution of knowledge as property, What are Intellectual property rights?, Classification of intellectual property, Role of WTO & WIPO, The patenting process, Patent infringement, Copyrights, Requirements for registration of a copyright, Copyright infringement. Fair use of copyrighted material, Trade secrets, Reverse engineering, Protecting software.

Environmental & Health Concerns: Introduction, Manufacturing in the 21st century, Resource conservation, the social costs of environmental destruction (land, water & air pollution), ISO 14000 standards & approaches to environmentally friendly technology, carbon trading, international treaties & their limitations.

Text/Reference Books
1. Managing intellectual Capital: Organizational, Strategic & Policy Dimensions. Teece D.J. Oxford University Press. 2000.
2. Profiting from Intellectual Capital: Extracting Value from Innovation. Sullivan P.H. John Wiley. 1998.
3. Intellectual property law in India. Narang P.S. Georgia Law Agency. 2001.
4. ISO 9000 Quality systems Handbook. Hoyle D. 6th Ed. A Butterworth-Heinemann. 2009.
5. Implementing ISO 9000: 2015. Purushothama B. Edited. WPI Publishing. 2014.

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Semester - VIII

(Departmental Core Subject)

CE-470   L-T-P-C
Major Project   0-0-4-4

After completion of the Minor Project, students shall undertake the Major Project in the VIII Semester. The idea conceived in the Minor Project shall be executed in this semester under the supervision of the faculty member. Students shall complete the practical aspect of the project. Thereafter they will prepare a report, as per the prescribed format/ guidelines, incorporating the results, their analysis & interpretation. The report, duly certified by the Supervisor, should be submitted to the Head of the Department.

Progress made by the student will be continuously monitored & evaluated as per the approved procedure.

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Semester - VI

(Departmental Elective - I)

CE-362   L-T-P-C
Prestressed Concrete & Industrial Structures   3-0-0-3

Objective: *To be able to perform analysis & design of prestressed concrete members & connections; to be able to understand the general mechanical behavior of prestressed concrete; design for vertical & horizontal shear in prestressed concrete.*

Course Content

Design of prestressed concrete sections for flexure, shear, bond & anchorage forces minimum weight design; Analysis & design of indeterminate prestressed structures, Choice of cable profiles, Concordancy & linear transformation of cable profile, effect of creep &shrinkage on prestressed concrete structures; Design of end block, Partial prestressing, Definition- principles & design approach, Composite structures; Wind load analysis on Industrial building, Braced & Unbraced Industrial building.

Text/Reference Books
1. Prestressed Concrete: A fundamental approach. Nawy E. G. Prentice Hall. 1995.
2. Design of Prestressed Concrete Structures. Lin T.Y. John Wiley, & Sons. 1963.
3. Prestressed Concrete. Mallick S.K. & GuptaA.P. Oxford & IBH. 1992.
4. Steel Structures-Design &Behaviour. CharlesG.S. & Johnson J.E. Addison - Wesley Pub Co. 1997.
5. Advanced analysis of steel frames. Chen W.F. &TomaS. CRC press.1994.

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Semester - VI

(Departmental Elective - I)

CE-363   L-T-P-C
Urban Transportation Planning   3-0-0-3

Objective: *The aim of this course is to know about the process & concepts of transportation planning & to study about trip generation & trip distribution by various methods such as modal split analysis.*

Course Content

Urban transportation problem; travel demand; data collection & inventories; four stage demand forecasting - trip Generation, trip distribution, mode split, & traffic Assignment; traffic corridors; urban freight travel demand; plan preparation & evaluation; case studies.

Text/Reference Books
1. An Introduction to Transportation Planning (The Living Environment). Bruton M. J. UCL Press. London. UK. 2000.
2. Transportation Planning Handbook. Edwards J. D. 2nd Ed. Institution of Transportation Engineers.1999.
3. Principles of Urban Transportation System Planning. Hutchinson. B.G. McGraw Hill. 1974.
4. Urban Transportation Planning: A Decision Oriented Approach. Mayer M. & Miller E. McGraw Hill. 2000.

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Semester - VI

(Departmental Elective - I)

CE-364   L-T-P-C
Ground Improvement & Ground Engineering   3-0-0-3

Objective: *This course provides an overview of latest ground improvement techniques. This course will help to understand the problems related to soil & select the best method to improve the soil. This course gives the detail knowledge of various soil stabilization techniques.*

Course Content

Soil compaction: laboratory methods, field methods, compaction control; Soil stabilization: using additives, sand drains, stone columns, lime columns; Grouting: types of grouts, methods of grouting; Soil reinforcement: using strips, geogrids, geotextiles, geomembranes; Dewatering methods; Soil nailing; Underpinning; Tunneling.

Text/Reference Books
1. Soil Mechanics. Lambe T.W. & Whitman R.V. John Wiley & Sons. 1969.
2. Soil Mechanics in Engineering Practice. Terzaghi K., Peck R. B. & Mesri G. John Wiley & Sons. 1996.
3. Engineering Principles of Ground Modification. Hausmann M. R. McGraw Hill. 1990.

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Semester - VII

(Departmental Elective - II)

CE-458   L-T-P-C
Pavement Design   3-0-0-3

Objective: *This course covers the types & components of pavements. The course will educate the students about the stresses in flexible pavements & equivalent single wheel load. The course also includes knowledge of design of flexible & rigid pavements as per the different Indian Road Congress & Indian Standard Codes.*

Course Content

Pavement Materials, Pavement as multilayered structure, sub grade, base &subbase, bituminous materials, individual properties, non-linear models of granular materials & bituminous mixes elastic modules & Poisson's ratio, concrete pavement, Pavement Design, AASHTO, Shell, Asphalt Institute, Japan, Austoroads methods, analytical pavement design, Indian context, overlay design, Pavement Management, Pavement evaluation, Benkelman beam & Falling Weight Deflectometer, pavement maintenance management, financial viability.

Text/Reference Books
1. The Design & Performance of Road Pavements .D. Croney & P. Croney. 2nd Ed. McGraw-Hill, International Series in Civil Engineering. 1992.
2. Ministry of Surface Transport, Government of India, Specification for Road & Bridge Wok. 3rd revision. IRC. 1995.
3. Principles of Pavement Design. Yoder E. J. & Witczak M. W. Joh. 2nd Ed. Wiley & Sons1975.

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Semester - VII

(Departmental Elective - II)

CE-454   L-T-P-C
Bridge Engineering   3-0-0-3

Objective: *To develop an understanding of & appreciation for basic concepts for proportioning & design of bridges in terms of aesthetics, geographical location & functionality & to help the student develop an intuitive feeling about the sizing of bridge elements.*

Course Content

Investigation & site selection, hydraulic factors, alignment, traffic aspects, types of bridges; Loading standard, IRC specification, Impact factor, General design consideration, Structural design of highway & railway bridges in masonry, reinforced, pre-stressed concrete & steel; Superstructures: Slab bridge, beam & slab bridge, plate girder & composite bridges, Bearings & expansion joints, Bridge foundation: Types of foundation, design of well & pile foundation, Bridge vibration: traffic loading, seismic & wind effect, construction techniques & maintenance.

Text/Reference Books
1. Essentials of Bridge Engineering. Victor D. J. Oxford & IBH. 1980.
2. Design of Bridges. Raju N. K. Oxford & IBH. 1988.
3. Concrete bridge Practice: Analysis, Design & Economics. Raina V. K. Tata McGraw Hill. 2002.
4. Dynamics of Railway Bridges. Fryba L. Thomas Telford. 1996.

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Semester - VII

(Departmental Elective - II)

CE-457   L-T-P-C
Design of Foundations & Retaining Structures   3-0-0-3

Objective: *To impart the knowledge in the area of analysis & design of foundations & earth retaining structures &to be able to understand the concept of shallow & deep foundations*

Course Content

Advanced bearing capacity theories; Design of shallow foundations: strip footings, isolated footings, combined footings, rafts; Design of deep foundations: single piles, pile groups, pile caps, caissons, vertical uplift & lateral capacity; Design of retaining structures: rigid and flexible walls, coffer dams, diaphragm walls, braced cuts.

Text/Reference Books
1. Foundation Analysis & Design. Bowles J.E. McGraw Hill. 1996.
2. Design of Foundation Systems. Principles & Practices. Kurian P.N. Narosa. 1994.
3. Foundation Design & Construction. Tomlinson M.J. Addison Wesley. 2001.
4. Pile Design & Construction Practice. Tomlinson M.J. E & FN Spon. 1987.
5. Foundation Engineering. Peck R. B., Hanson W. E. & Thornburn T. H. John Wiley & Sons. 1974

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Semester - VIII

(Departmental Elective - III)

CE-456   L-T-P-C
Pavement Management Systems   3-0-0-3

Objective: *The aim of this course is to introduce pavement management system & its importance, pavement evaluation, Deterioration Models & networking. This curse also aims at imparting knowledge of determining optimum standards & allocating budget to highway projects by various development models.*

Course Content

Introduction to Pavement Management Systems, Functional & structural condition of pavements, Pavement network, Pavement Distress survey, Rating procedures, Present Serviceability concept, Roughness Measurement & analysis, IRI Index, Skid Resistance Measurement, Structural Evaluation of Pavements by Nondestructive testing, Back calculation Analysis, Pavement strengthening based on Deflection data,

Pavement Distress Identification & equipment, Pavement Condition Prediction Models, Maintenance & rehabilitation techniques, Network & project level Management, PMS based on analytical empirical method, Future Directions & Research needs in PMS, Highway Development & Management (HDM) for road project investments.

Text/Reference Books

1. Pavement Management for Airports. Roads & Parking lots. Shahin M.Y. Chapman & Hall. 1994.
2. Pavement Analysis &Design. Yang H. & Prentice-Hall. 1993.
3. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation & Renovation. Hudson W. R. & Haas R. McGraw Hill. 1997.
4. Modern Pavement Management. Hudson W.R., Haas R, & Zaniewski J.P. Krieger Publishing Company. 1984.

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Semester - VIII

(Departmental Elective - III)

CE-461   L-T-P-C
Solid Waste Engineering   3-0-0-3

Objective: *To study the concept of designing an efficient waste management system. It includes solid waste management & hazardous waste engineering. It also helps the students in understanding the various legal & administrative considerations.*

Course Content

Solid waste- history, materials flow, the need for integrated solid waste management; Municipal solid waste-characteristics & quantities; Collection Systems-municipal wastes; commercial wastes, recyclable materials; Material separation & processing of municipal solid waste; Combustion & energy recovery-heat value, materials & thermal balances, combustion hardware, undesirable effects; Biochemical process-anaerobic digestion, composting & other processes; Landfills-planning, sitting, landfill processes, landfill design, landfill operations, post-closure care & use of old landfills; Current issues in solid waste management.

Text/Reference Books

1. Solid Waste Engineering. Vesilind P. A., Worrel W. A. & Reinhart D. R. Thomson Brooks/Cole. First Ed. 2002.
2. Environmental Engineering. Peavy H. S., Rowe D. R. &Techobanoglous G. McGraw-Hill. International Ed. 1985.
3. Introduction to Environmental Engineering. Davis M. L. & Cornwell D. A.Mcgraw-Hill, Inc. International Ed., 1991.
4. Environmental Engineering - A Design Approach. Sincero A. P. & Sincero G. A. Prentice- Hall India, 1996.

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Semester - VIII

(Departmental Elective - III)

CE-459   L-T-P-C
Computer Aided Design   3-0-0-3

Objective: *To be able to learn the software developing skills for structural design &to understand the computing techniques in the field of transportation, etc.*

Course Content

Principles of Computer aided design. Computer graphics fundamentals. Points & lines; 3D transformation & projections; Plane curve & space curve; Surface description & generation; Hidden line algorithm for wireframe modelling; Surface modelling; Solid modelling; Representation of 3-D objects; Data Structure-Concept of link list, stack, Queue, Tree.

Text/Reference Books

1. Computer graphics: A Programming approach. Harrington S.McGraw Hill. 1987.
2. Mathematical elements of Computer Graphics. Rogers D. F. & Adams J.A.McGraw Hill. 1990.
3. Computer Graphics: Principle & Practice in C. Foley J.D., Dam A.V., Feiner S. K. &Huges. J. F. Addison Wesley Publishing Company.1995.

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Semester - IV

(Open Elective - I)

HU-252   L-T-P-C
Language through Literature & Films   0-2-0-2

Objective: *To introduce the nuances of English Literature & develop reflective, creative & literary abilities.*

Course Content

The Eyes Have It - Ruskin Bond.

Appro JRD - Sudha Murthy.

Bacon - Of Study; Of Youth and Age.

Douglas Malloch - Be the best of whatever you are.

Rabindranath Tagore - Where the mind is without fear.

Enhancement of emotional, creative & social quotient through viewing & discussions on selected films.

Text/Reference Book
1. Literature and Language Teaching: A Guide for Teachers and Trainers. Lazar G. Cambridge University Press. 2008.

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Semester - IV

(Open Elective - I)

BM-270   L-T-P-C
Foundations of Economic Science   2-0-0-2

Objective: *The objective of this course is to teach basic principles of consumption production, exchange, distribution of remuneration to factors, pricing & public finance. Further, students are provided knowledge on completion of projects by optimizing production with limited resources & also to know infrastructure & development needs of a country to perform tasks accordingly.*

Course Content

Engineers & Economics: Meaning of economics, why engineers should know economics, important basics: consumption, production, exchange, distribution & public finance, cost of production & revenue through sales.

Consumption & Pricing: Cardinal & Ordinal approach to Utility, Laws of Diminishing Marginal Utility & Equi-marginal Utility, Demand: Meaning, Law, Types, Elasticity of Demand: Meaning & Degrees. Laws of Supply, Pricing of all products: Theory & practice.

Factors of Production & Markets: Land, Labour, Capital, Organization & Enterprise, Laws of Returns, Classification of Markets: Perfect & Imperfect competition including Monopoly, Discriminative Monopoly & Oligopoly.

Financial Aspects of Engineering: Money & Finance, An overview of Banking, Money Market, Capital Market, Public Finance & Private Finance, Direct & Indirect Taxes, Canons of Taxation, National Income.

Developmental Aspects of Engineering: Underdevelopment, Stages of economic development, Economic Growth, Growth Theories Economic Reforms: LPG. Application of financial accounting techniques for engineering projects.

Text/Reference Books

1. Textbook of Economic Theory. Stonier A. W. & Hague D. C. 5th Ed. Longman Higher Education. 1980.
2. Introduction to Positive Economics. Lipsey R. G. & Chrystal K. A. 8th Ed. Oxford University Press. 1995.
3. Business Economics (Micro). Shankar G. Nirali Prakashan. 2014.
4. Micro Economic Theory. Jhingan M. L. 7th Ed. Vrinda Publications Pvt. Limited. 2014.
5. Managerial Economics. Theory and Application. Mithani D. M. 7th Ed. Himalaya Publishing House Pvt. Ltd. 2013.
6. Micro economics. Pindyck R.S., Rubinfeld D. L. & Mehta P. L. 7th Ed. Pearson Education India. 2009.

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Semester - V

(Open Elective - II)

HU-351   L-T-P-C
Fun with Drama   0-2-0-2

Objective: *To stimulate imagination, cultural enrichment & explore multidimensional use of language through drama.*

Course Content

Script writing: Story, structure, character development, dialogue, visuals & language with emphasis on critical & analytical thinking, problem-solving & communication skills.

Direction: Techniques & art of play direction with emphasis on methods of actor coaching, rehearsal procedures & presentation of several scenes of varying dramatic styles.

Enactment: Controlled use of body & voice, analysis & interpretation of roles, characterization & emotional projection.

Analysis: Insightful analysis of various aspects of translating a play from script to stage, director's concepts, visual composition, attention to character development & narrative structure & power of the unspoken word.

Text/Reference Books
1. Drama Techniques in Language Learning. Maley A. & Duff A. 3rd Ed. Cambridge University Press. 2005.
2. Drama (Resource Book for Teachers). Wessels C. Oxford University Press. 1987.

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Semester - V

(Open Elective - II)

BM-370   L-T-P-C
Marketing Management   2-0-0-2

Objective: *Marketing is no longer a department charged with a limited number of tasks-it is a companywide undertaking. Marketing succeeds only when all departments work together to achieve goals. The syllabus is designed to serve as an introduction to the theory & practice of marketing to the engineering students. It will help them develop competencies in the use of the modern marketing techniques & their applications in design, development & commercialization of new products & services in the rapidly changing markets.*

Course Content

Introduction: Nature & scope of marketing; Importance of marketing as a business function; Marketing concepts – traditional & modern; Selling vs. marketing; Marketing mix & environment, Marketing Myopia.

Consumer Behaviour & Market Segmentation: Significance of consumer behavior; Market segmentation; concepts & importance; Bases for market segmentation.

Product: Concept of product, consumer & industrial goods; Product planning & development: Product life cycle concept, New Product Development, Product Differentiation & Positioning.

Branding: Role of brand & its Significance, Types of Brands, Challenges for Brands, Brand Equity.

Price: Importance of price in the marketing mix; Factors affecting price of a product/ service.

Distributions: Distribution channels; concept & role; Types of distribution channels; Factors affecting choice of a distribution channel.

Communications: Techniques of promotion; Integrated Marketing Communications; Advertising: Role & Significance. Media & their relative merits & limitations, Public Relations & Personal Selling.

E-marketing management: Overview of e-commerce, E-marketing: Role of IT in marketing, E-Marketing-mix, Emerging technology trends & their implications for marketing, Social media & marketing, E-CRM & building relationship.

Text/Reference Books
1. Marketing Management- A south Asian Perspective. Kotler P., Keller K., Koshy A. & Jha M. 12th Ed. Pearson Education. 2007.
2. Marketing Management. Kotler P. & Keller K. Prentice Hall. 2003.
3. Fundamentals of Marketing. Stanton W. J., Michael E. J. & Walker B. J. McGraw-Hill International. 1997.
4. Principles of Marketing. Kotler P. & Armstrong G. Pearson Education. 2007.
5. Fundamentals of Marketing. Stanton W. J. 5th Ed. McGraw-Hill, New York. 1978.
6. Marketing Environment: Planning, Implementation and Control, the Indian context. Ramaswamy V.S. & Namakumari S. Mcmillan. 1990.

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Semester - VII

(Open Elective - III)

BT-471   L-T-P-C
Bioprocess Technology   3-0-0-3

Objective: *A* bioprocess *is a specific process that uses complete living cells or their components to obtain desired products which is an importance part of biotechnology industry. This course is designed to make a learner efficient in bioprocess calculations & to impart knowledge of different technology used in bioprocess.*

Course Content

Bioprocessing v/s chemical processing, Substrates for bioconversion processes Inoculum development. Process technology for production of primary metabolites: such as baker's yeast, ethanol, citric acid, amino acids, polysaccharides & plastics, Microbial production of industrial enzymes such as glucose isomerase, cellulase, amylase, protease etc., Production of secondary metabolites: penicillin & cephalosporin etc.

Text/Reference Books
1. Encyclopedia of Bioprocess Technology. Michael F. & Stephen D.. John Wiley & Sons.1999.
2. Principles of Fermentation Technology. Stanbury P.F., Whitaker A. & Hall S. J. 2nd Ed. Elsevier.1995.
3. Microbial biotechnology: Fundamentals of Applied Microbiology. Glazer A.N. & Nikaido H. 2nd Ed. W.H. Freeman & Company. 1995.

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Semester - VII

(Open Elective - III)

CE-462   L-T-P-C
Air Pollution & Industrial Waste Management   3-0-0-3

Objective: *To give understanding of air pollution & its impact, modeling of dispersion of pollutant, control measures, types of waste from different industries & their management.*

Course Content

Air Pollutants, their sources & harmful effects on the environment; Meteorology as applied to air pollution & dispersion of air pollutants, Air quality & emission standards, Removal of gaseous & particulate matter. Sources & types of wastes; solid, liquid & gaseous wastes; Water use in industry, industrial water quality requirements; Control & removal of specific pollutants in industrial wastewaters from dairy, fertilizer, distillery, tannery, sugar, pulp & paper, iron & steel, metal plating etc.

Text/Reference Books
1. Air Pollution-Its Origin and Control. Wark K. & Warner C. F. Harper & Row New York. 1981.
2. Air Pollution Control Engineering. Nevers N. D. McGraw-Hill International Ed. 1985.
3. Zero Pollution for Industry: Waste Minimization through Industrial Complexes. Nemerow N. L. John Wiley & Sons.1995.
4. Liquid Waste of Industry: Theoy, Practices and Treatment. Nemerow N L. Addison-Wesley. 1971.
5. Wastewater Treatment for Pollution Control. Arceivala S. J. Tata McGraw-Hill. 1999.
6. Industrial Water Pollution Control. Eckenfelder W. W. McGraw-Hill. 2000.

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Semester - VII

(Open Elective - III)

CS-458   L-T-P-C
Information Retrieval   3-0-0-3

Objective: *This course deals with the basic information retrieval approaches to perform the various types of searching, indexing & retrieval from structured or unstructured data & their applications.*

Course Content

Introduction: concepts & terminology of information retrieval systems, Information Retrieval vs. Information Extraction; Indexing: inverted files, encoding, Zipf's Law, compression, boolean queries; Fundamental IR models: Boolean, Vector Space, probabilistic, TFIDF, Okapi, language modeling, latent semantic indexing, query processing & refinement techniques; Performance Evaluation: precision, recall, F-measure; Classification: Rocchio, Naive Bayes, k-nearest neighbors, support vector machine; Clustering: partitioning methods, k-means clustering, hierarchical; Introduction to advanced topics: search, relevance feedback, ranking, query expansion.

Text/Reference Books
1. An Introduction to Information Retrieval. Manning C. D., Raghavan P. & Schtze H. Cambridge University Press. 2009.
2. Modern Information Retrieval. Ricardo B. Y. & Berthier R. N. 1st Ed. Addison-Wesley Publishing Co. 1999.
3. Information Retrieval: Algorithms and Heuristics. Grossman D. A. & Frieder O. Springer – The Information Retrieval Series. 2004.

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Semester - VII

(Open Elective - III)

CS-462   L-T-P-C
Management Information Systems & E-Commerce   3-0-0-3

Objective: *The course aims at acquainting students with the fundamentals of information systems & their application in the various areas of business. It also provides an overview of the emerging domain of e-commerce, its concepts, issues & technologies.*

Course Content

Management Information Systems: Need, Purpose & Objectives- Contemporary Approaches to MIS: Business processes & Information Systems –Information systems function in Business-Use of Information Systems for competitive advantage - MIS as an instrument for the organizational change: Management issues – Types of Business Information Systems.

Enhancing Decision Making: Information, Management & Decision Making - Models of Decision Making - Classical, Administrative & Herbert Simon's Models - Attributes of information & its relevance to Decision Making - Types of information, Decision Support Systems - Group Decision Support Systems –- Executive Support Systems

E-commerce: Introduction, Definition of e-commerce, emergence of Internet, commercial use of Internet, history of e-commerce, advantages & disadvantages of e-commerce.

Business models for e-commerce: B2C, B2B, C2C, C2B, brokerage model, aggregator model, info-mediaries, communities, value-chain model, manufacturer model, advertising model, subscription & affiliate model.

Enabling technologies: Internet Client server applications, networks, Uniform Resource Locator (URL), search engines, software agents, Internet Service Providers(ISP), broadband technologies, Electronic Data Interchange(EDI).

E-marketing: characteristics, methods, e-marketing value-chain, site adhesion, browsing behavior model, e-advertising, e-branding, e-marketing strategies.

E-security: Security risks, risk management issues, legal & ethical issues, security mechanisms, encryption, digital signature, digital certificates.

E-payment systems: token-based system, card-based system, e-cash. E-cheque, e-banking, risks, data protection.

Text/Reference Books
1. Management Information Systems. Laudon & Laudon, 7th Ed. Pearson Education Asia.
2. E-commerce: An Indian Perspective. Joseph P. T. 2nd Ed. Prentice Hall India. 2007.
3. Management Information Systems. Bagchi N. 1st Ed. Vikas Publishing. 2010.

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Semester - VII

(Open Elective - III)

EC-475   L-T-P-C
Computer Networks   3-0-0-3

Objective: *To discuss the principles of data communication, the functions of different layers, IEEE standards employed in computer networking & the different protocols & network components.*

Course Content

Fundamentals of Communications & Networking: Network Topology, LAN, Network node components- Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN Transmission Technology, Communications protocols. Basic Concept of layering & connection oriented & connection less services, Network structure & architecture, the OSI reference model, TCP/IP Architecture, Networks topology.

OSI Network Management: OSI Network management model – Organizational model – Information model, communication model, OSI & TCP/IP Model design issues, Layers of OSI & TCP/IP Model.

Data Link Layer & Data link layer protocols: Elementary data link protocols, Sliding windows protocols, Error handling, Parity Bit Check, CRC, Checksum, Hamming Code, Hamming Distance, Overview of High Level Data Link Control (HDLC) & Ethernet.

Network Layer: IP Header (IPv4 & IPv6), IP addresses – Calculating IP address & design, TCP/IP packet, ICMP, ARP, RARP, IGMP.

Interior Gateway routing Protocol: OSPF, Exterior Gateway Protocols: BGP.

Point-to-Point networks, Routing algorithms, congestion control algorithms, internetworking.

Transport Layer: Design issues, connection management, User Datagram Protocol: UDP protocol & Header, Transmission Control Protocol: TCP protocol, TCP segment Header Format, TCP window Management, TCP Timer Management.

Application Layer (services & protocols): WWW, Hyper Text Transfer Protocol, Domain Name System (DNS), Electronic mail (SMTP, POP, IMAP), File Transfer Protocol (FTP, TFTP).

Text/Reference Books
1. Computer Networks. Tanenbaum A. S. 3rd Ed. PHI/PE. 2011.
2. Data Communication & Networking. Forouzan B. A. 4th Ed. Tata McGraw-Hill. 2007.

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Semester - VII

(Open Elective - III)

EE-465   L-T-P-C
Energy Conversion Process   3-0-0-3

Objective: *To get acquainted the students with various energy conversion processes used in non-conventional energy sources.*

Course Content

Physics of photovoltaic energy conversion in P-N junctions. Effect of physical properties of photovoltaic converters; Performance characteristics of different types of photovoltaic devices; Design considerations & manufacturing processes; Regulations & efficiency of conversion. Charge carriers & thermoelectric phenomena; Thomson, Peltier, Seebech effect; Kelvin's relations; Thermoelectric energy conversion; Materials, size & capacity; Performance analysis & optimized design of thermoelectric devices. Physics of thermionic emission; Operation of high level vacuum & low pressure thermionic converters; Vacuum & gas-filled converters; Thermionic nuclear reactors; Heat pipes. Basic principles of Magneto hydrodynamic power generation; Hall effect; Ionization & seeding; Faraday, Segmented electrode, Hall & Cross-connected generators, Open & closed cycles; Liquid metal MHD. Fuel cells, Thermodynamics of Fuel Cells. Performance Analysis. Low, medium, high temperature Fuel Cells.

Text/Reference Books
1. Energy Conversion Systems. Begamudre R. D. 1st Ed. New Age Pub. 2000.
2. Solar PV and Wind Energy Conversion Systems: An Introduction to Theory, Modeling with MATLAB/SIMULINK & the Role of Soft Computing Techniques (Green Energy and Technology) Sumathi S., Kumar A. L. & Surekha P. Springer. 2015.

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Semester - VII

(Open Elective - III)

ME-465   L-T-P-C
Solar Energy & Applications   3-0-0-3

Objective: *This course discusses solar energy as an important alternative to conventional sources of energy-its generation & utilization.*

Course Content

The energy crisis- causes & options, renewable & non-renewable forms of energy & their characteristics, solar energy option availability & land area requirements. Solar radiation outside the earth atmosphere & at the earth`s surface, instruments for measuring solar radiation, solar radiation geometry, basic earth-sun angles, flux on tilted surfaces. Liquid flat-plate collectors design & performance parameters, solar air heaters, concentrating collectors, solar ponds & energy storage. Solar thermal power generation: low, medium & high temperature cycles, solar cooling, drying & desalination, solar air & water heating, solar passive architecture. Solar photovoltaic power generation: monocrystalline, polycrystalline & amorphous cells, Fabrication & performance of SPV modules. Indirect methods of solar energy utilization: biomass, wind, wave & ocean thermal energy conversion technologies. Economic considerations.

Text/Reference Books
1. Solar Energy principles of thermal collection and storage. Sukhatme. Tata McGraw-Hill. 1996.
2. Solar Energy fundamentals and applications. Garg & Prakash. Tata McGraw-Hill. 1997.

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Semester - VII

(Open Elective - III)

PH-451   L-T-P-C
Nanotechnology   3-0-0-3

Objective: *The objective of this course is to discuss why & how changes occur in the properties of bulk materials when their size approaches a billionth of a meter & to understand the basics of nanostructures, nanotubes, nano-electronic devices, nanobiotechnology, nanomachines etc.*

Course Content

Basics of low dimensional (0D, 1D, 2D) structures, Quantum dots wires & wells, Nanoparicles-free & dispersed, Nanocrystalline & nanostructured films, Self-organized structures; Nanostructures for optical & electronic applications, Quantum dot diodes, lasers & detectors, Single electron devices & logic applications, Optical computing & Information processing; Carbon based nanostructures, Electrical, mechanical & chemical properties of carbon nanotubes, Sensors & drug delivery vehicles, Data processing; Bulk nanostructured material & Photonic crystals; Nanostructures for Magnetic applications, Giant & Colossal Magnetoresistance. Nanostructured ferromagnetism, Random Access Memories; Nanostructures for catalysis & hydrogen storage, Nanoclays, colloids & hydrogen storage nano materials. Organic & Biological nanostructures. Nanomachines & supra molecular devices.

Text/Reference Books
1. Introduction to Nanotechnology. Poole Jr. C. P. & Owens F. J. 1st Ed. Wiley-India Edition. 2007.
2. Nanotechnology: Principles & Practices. Kulkarni S. K. 3rd Ed. Springer. 2014.
3. Introduction to nanoelectronics. Mitin V. V., Kochelap V. A. & Stroscio M. A. 1st Ed. Cambridge University Press. 2007.

4. Nanoelectronics & Nanosystems. Goser K., Glosekotter P. & Dienstuhl J. 2nd Ed. Springer. 2009.

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Semester - VII

(Open Elective - III)

PH-453   L-T-P-C
Chaos in Engineering Systems   3-0-0-3

Objective: *The objective of this course is to introduce the importance of nonlinearity & its ubiquity in engineering systems. The various techniques/tools used to understand the dynamics of nonlinear systems with examples from various engineering disciplines shall be discussed.*

Course Content

Introduction to chaos. Various examples of chaos in engineering systems, electrical systems (Van Der Pol oscillator); Fluid mechanical systems (Lorenz equations, Aeroelastic flutter), Vibration (Duffing equation), Chemical reactions (Belousov-Zhabotinski reaction) etc. Basic concepts in the mathematical treatment of non linear systems. Note: The emphasis in this course will be on developing a physical understanding of chaotic systems. There will be computer simulation demonstration.

Text/Reference Books
1. Chaos and Non-linear dynamics. Hilborn R. 2nd Ed. Oxford University Press. 2001.
2. Non-linear dynamics and chaos. Strogatz S. H. 1st Ed. Perseus books. 2001.
3. Non-linear dynamics. Lakshmanan M. & Rajsekar S. 1st Ed. Springer. 2003.

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Semester - VIII

(Open Elective - IV)

BT-475   L-T-P-C
Bioremediation Technology   3-0-0-3

Objective: *This course is designed to learn advance technology which use microorganisms & plants to remediate polluted & contaminated sites e.g. Industrial waste water, sewage etc. as well as to make students learn about emerging technologies in this area.*

Course Content

General Introduction, toxic chemicals in the environment, Xenobiotic compounds, Properties, toxicity & types of toxicity, classification of toxicants in environment; atmospheric toxicants; Conventional remediation, thermal, chemical & physical processes, role of microorganisms in pollutant degradation, Bioremediation: process, classification: *In situ* & *Ex situ* bioremediation; constrains & priorities of bioremediation; evaluation of bioremediation; factors affecting process of bioremediation, methods in determining biodegradability; contaminant availability for biodegradation. Microbial remediation & phytoremediation, Impact of biotechnology on bioremediation & global application of bioremediation technologies & case studies, Emerging Environmental Biotechnologies: Bioleaching, Biosorption Biotransformation, Biomonitoring, Microbial fuel cells.

Text/Reference Books
1. Cell biology, Genetics, Molecular Biology Evolution & Ecology. Verma P. S. & Agarwal V. K. S. Chand publication. 2005.
2. Environmental Biotechnology. Shrinivas T. New Age International (P) Limited. 2008.

3. General Microbiology. Stanier R.Y., Michael D. & Edward A. 2nd Ed. McMillan Publications. 1989.
4. Environmental Biotechnology. Foster C. F. & John W. D. A. Ellis Horwood Ltd. 1987.
5. Biotechnology & Biodegradation: Advances in Applied Bitoechnology Series. Karrely D. Vol -4. Gulf Publications Co. 1989.
6. Bioremediation engineering; design & application. John C. 1st Ed. McGraw-Hill.
7. Introduction to Envionmental Biotechnology. Chatterjee A. K. 3rd Ed. PHI Learning Pvt. Ltd. 2011.
8. Environmental Biotechnology. Joganand S. N. 4th Ed. Himalaya Publishing. 2015.

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Semester - VIII

(Open Elective - IV)

CE-464   L-T-P-C
Environmental Management   3-0-0-3

Objective: *To develop the understanding of various environmental management techniques, legal procedure in India, development of environmental friendly industries, environmental audits & concept of green buildings.*

Course Content

The need for environmental awareness & protection in both natural & man-made systems – effects on atmosphere, water, ecological systems & quality of life. Environmental Impact Assessment & Integrated Environmental Management, Practical applications – cradle to grave concept, life cycle analysis & clean technologies. Environmental Audit, Compliance Audit; Concept of ISO & ISO 14000. Needs of developing countries. Governmental standards for Environmental Protection. Emerging Global Environmental Issues. Environmental Legislation.

Text/Reference Books
1. Environmental Impact Analysis Handbook. John R. G. & David W. C. McGraw-Hill. 1980.
2. Environmental Management in South Africa. Fuggle R. F. & Rabie M. A. Juta & Co. Ltd., Johannesburg. 1991.
3. Pollution – Causes, Effects and Control. Harrison R. M. Whitstable Lithop Ltd. 1990.
4. Environmental Impact Assessment. Canter L. W. McGraw-Hill. 1996.

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Semester - VIII

(Open Elective - IV)

CS-459   L-T-P-C
Statistical Simulation & Data Analysis   3-0-0-3

Objective: *The course is designed to discuss the methods to simulate the statistical inferences obtained from the various datasets. The course discusses the various data analysis methods available & their usage in generating inference from the datasets.*

Course Content

Introduction to probability distributions. Basics of estimation & testing of hypothesis (frequentist approach, Bayesian approach).

Different censoring schemes: Type-I, Type-II, hybrid, progressive. Different models & EM algorithm: mixture model; bivariate distributions; cure rate model; competing risk model.

Generating random sample: discrete & continuous multivariate distributions (multinomial, multivariate normal, multivariate exponential); acceptance rejection principle; Monte Carlo markov chain (metropolis Hastings algorithm, Gibbs sampler); Convergence of MCMC : Harris irreducibility, recurrence, minorization, limit theory for Harris recurrent markov chains.

Resampling techniques: jackknife; bootstrap. Hidden Markov Model (forward-backward algorithm, Viterbi algorithm, Baum-welch algorithm). Artificial Neural Network: framework, topology (feed forward neural network, recurrent neural network), training of ANN (supervised, unsupervised, reinforced learning), robustness. Genetic Algorithm: single objective GA, multi-objective NSGA.

Text/Reference Books

1. Simulation. Ross S. M. 4th Ed. Academic Press. 2006.
2. Data Analysis and Decision Making. Albright S. C., Winston W. L., Zappe C. J., Hinrichs C. & Rogove J. South-Western Publisher. 2002.
3. Data Analysis, Optimization and Simulation Modeling. Albright B. 4th Ed. Cengage. 2012.

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Semester - VIII

(Open Elective - IV)

EC-473   L-T-P-C
Robotics & Automation   3-0-0-3

Objective: *To introduce the basic concepts, parts of robots & types of robots & to make the student familiar with the various drive systems for robot & various applications of robots, justification & implementation of robot.*

Course Content

Introductory Concepts: Introduction to robotics, robotics history & development, classification of robotics, robotics applications & current research trends in robotics. Basic Components of Robotics Systems: Robotics manipulators & mechanisms actuators-pneumatics, hydraulics & electrics, sensors classifications, internal & external sensors.

Kinematics: Introduction to robotic manipulators, position & orientation of object space, robots coordinate transforms, Forward position analysis, Denavit-Hartenberg representation & parameter calculation, inverse position analysis & parameter calculation.

Euler angles & computation of parameters for different robot configurations.

Statics: Force & moment balance, recursive calculation, equivalent joint torque.

Dynamics: Inertia properties, Euler-Lagrange formulation, Newton-Euler formulation, recursive Newton-Euler algorithm, dynamic algorithm, recursive robot dynamics.

Control: control techniques, second order linear system, feedback control system & performance of feedback control system, robotic joints & joint controller, non-linear trajectory control.

Motion planning: General consideration in path description & generation, Joint space planning, Cartesian space planning, position & orientation trajectory, point to point planning, continuous path generation.

Introduction to robotic vision, image representation & analysis, template matching edge detection, space analysis, prospective transformation, camera calibration, image compression techniques.

Text/Reference Books
1. Introduction to Robotics. Saha S. K. Tata McGraw-Hill. 2009.
2. Introduction to robotics: Mechanics and control. Craig J. J. Addition Wesley Longman Publishing Co. 1989.
3. Introduction to Robotics (Analysis, Control, Applications). Niku S. B. 2nd Ed. Wiley India. 2011.
4. Robot Dynamics & Control. Spong M. W. & Vidyasagar M. Wiley. 1989.
5. Industrial Robotics & Manufacturing Automation. Groover M. P. Tata McGraw-Hill. 1998.

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Semester - VIII

(Open Elective - V)

BT-472   L-T-P-C
Bioelectronics & Biosensors   3-0-0-3

Objective: *This course imparts the knowledge of Biosensors, types of biosensors & their applications in online monitoring of bioprocesses.*

Course Content

Biosensors: components of biosensors, advantages & limitations; types of biosensors; biocatalysis based biosensors, bioaffinity based biosensors & microorganisms based biosensors, biologically active material & analyte. Types of membranes used in biosensor constructions. Design of enzyme electrodes & their applications as biosensors in industry such as health care & environment. Transducers in biosensors: piezoelectric, semiconductor, impedimetric, mechanical & molecular electronics based transducers. chemiluminiscene - based biosensors principles & applications; calorimetric, optical, potentiometric / amperometric conductrometric / resistormetric transducers; biosensors in clinical chemistry, medicine & health care, biosensors for veterinary, agriculture & food. Low cost- biosensor for online & environmental monitoring, Molecular electronics, assembly of photonic biomolecular memory store, information processing; commercial prospects for biomolecular computing systems.

Text/Reference Books
1. Biosensors for Environmental Monitoring. Bilitewski U. & Turner. A. P. F. Harwood. 2000
2. Biotechnology the Science & Business. Harwood, Moses V. & Cape. R. E. Academic Publisher London.1991
3. Biosensors for Analytical Monitoring. Rogers K. R. & Mascini M. EPA Biosensors Group. 2001.

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Semester - VIII

(Open Elective - V)

CS-461   L-T-P-C
Soft Computing   3-0-0-3

Objective: *This course deals with soft computing concepts, neural networks, fuzzy logic, use of heuristics based on human experience, genetic algorithm & its applications to soft computing , optimization problems to text analytics.*

Course Content

Introduction to Soft Computing: Rationale & Basics of Learning: Neural Networks: Multi-layer Feed-forward Networks, Recurrent Networks, Self-organizing Networks; Fuzzy Logic: Basics, inference scheme, Neuro-Fuzzy systems; Evolutionary Algorithms: GA & Optimization, Evolutionary Systems, Genetic Programming; Introduction to Rough Sets, Rough-Fuzzy representations, Belief Networks; Principles of SVM; Research based applications.

Text/Reference Books
1. Soft Computing: Fundamentals and Applications. Pratihar D. K. Narosa. 2015.
2. Neuro Fuzzy and Soft Computing. Jang J. S. R., Sun C. T. & Mizutani E. PHI. 2004.
3. Principles of Soft Computing. Sivanandam S. N. & Deepa S. N. 2nd Ed. Wiley. 2007.

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Semester - VIII

(Open Elective - V)

EE-466   L-T-P-C
Hydro Power Generation   3-0-0-3

Objective: *To get acquainted the students with various factors & control of hydro power plants.*

Course Content

Types of Hydro plants subsystems of hydro plant, turbines, hydro alternates hydro plant. Auxiliaries, control of hydro power, micro hydel systems & special problems in hydro plants.

Text/Reference Books
1. Hydro Plant Electrical Systems. David C. M. HCI Publications. 1999.
2. Hydro-electric and Pumped Storage Plants. Jog M. G. 1st Ed. New Age Pub. 1989.

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Semester - VIII

(Open Elective - V)

MA-453   L-T-P-C
Mathematical Statistics   3-0-0-3
Pre-requisite   MA-254 / MA-451

Objective: *To introduce the fundamental techniques of Sampling, Estimation & Hypothesis testing & illustrate these techniques with applications.*

Course Content

Review of Random variables. Order Statistics. Random sampling. The Central Limit Theorem. Sampling Distribution related to normal distribution. Point estimation. Bais & mean square errors of point estimators. Properties of point estimation & Methods of estimation. Confidence intervals. Large sample & small sample confidence intervals. Hypothesis testing. Common large sample tests p values. Small sample hypothesis tests. Power of tests & Neyman-Pearson Lemma.

Text/Reference Books
1. Statistical methods (Vol. II). Das N. G. 1st Ed. McGraw-Hill. 2009.
2. Probability statistics and random processes. Veerarajan T. 3rd Ed. Tata McGraw-Hill Education. 2008.
3. Higher Engineering Mathematics. Ramana B. V. 1st Ed. Tata McGraw-Hill Education. 2006.
4. Fundamentals of mathematical statistics. Gupta S. C. & Kapoor V. K. 11th Ed. S. Chand & Sons. 2002.

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Semester - VIII

(Open Elective - V)

ME-467   L-T-P-C
Total Quality Management   3-0-0-3

Objective: *This course discusses total quality is a description of the culture, attitude & organization of a company that aims to provide & continue to provide its customers with products & services that satisfy the needs.*

Course Content

Quality Concepts: Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods & Techniques for manufacture, Inspection & control of product, Quality in sales & services, Guarantee, analysis of claims.

Quality Management: Organization structure & design, Quality function, decentralization, Designing & fitting organization for different types products & company, Economics of quality value & contribution, Quality cost, optimizing quality cost, seduction programme. Human Factor in Quality: Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error & corrective methods. Control Charts: Theory of control charts, measurement range, construction & analysis of R charts, process capability study & use of control charts.

Attributes of Control Charts: Defects, construction & analysis off-chart, improvement by control chart, variable sample size, construction & analysis of C-chart. Defects Diagnosis & Prevention : Defect study, identification & analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in

the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. IS0-9000 & its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details

Text/Reference Books
1. Total Quality management. Lal H. Wiley Eastern Limited. 1990.
2. Beyond Total Quality Management. Bounds G. McGraw-Hill. 1994.
3. TQM in New Product manufacturing. Menon H. G. McGraw-Hill. 1992.