

□ B.TECH ENVIRONMENTAL ENGINEERING

Semester – I

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	GPT-301	Moral & Value Education	2	0	0	2
2.	LNG-302	Professional Communication –1	3	0	0	3
3.	ME- 304	Workshop Practice & Technology	2	0	2	4
4.	ME- 301	Engineering Graphics –I	0	0	2	2
5.	ME- 408	Engineering Thermodynamics	2	0	1	3
6.	CE-401	Engineering Mechanics	2	1	0	3
7.	PHY-311	Engineering Physics – I	3	0	1	4
8.	MAS-411	Engineering Mathematics –I	3	1	0	4

Semester – II

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	LNG-303	Professional Communication –II	3	0	0	3
2.	CHEM- 513	Engineering Chemistry	3	1	1	5
3.	CSIT-401	Computer & Languages	2	1	1	4
4.	ME- 401	Engineering Graphics –II	0	0	2	2
5.	MAS- 490	Engineering Mathematics – II	3	1	0	4
6.	ECE-301	Basic Electronics	2	1	1	4
7.	EE-302	Electrical Engineering	2	1	1	4
8.	PHY-312	Engineering Physics – II	3	0	1	4

Semester – III

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	ENV-415	Environmental studies – I	2	0	0	2
2.	MAS-590	Engineering Mathematics – III	3	1	0	4
3.	CSIT-403	Information Technology	2	0	1	3
4.	CE-405	Fluid Mechanics	2	1	1	4
5.	CE - 402	Surveying and leveling	2	0	2	4
6.	CE-408	Strength of materials	3	0	0	3
7.	CE – 403	Building material & Construction	2	1	1	4

Semester – IV

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	CE –435	Fundamental of Environmental Chemistry	2	0	2	4
2.	CE – 436	Structural Design	2	1	1	4
3.	CE – 422	Soil Mechanics & Foundation Engineering	3	0	1	4
4.	CE -437	Building Services	2	0	2	4
5.	MAS – 491	Computer Based Numerical & Statistical Techniques	3	1	0	4
6.	ENV – 416	Environmental Studies - II	2	0	0	2
7.	CE-441	Environmental Microbiology	3	0	1	4
8.	CE-439	Environmental Physics	3	0	0	3

Note: Four Weeks Practical summer training-I after IV Semester (to be evaluated in V Semester)

Semester – V

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	CE – 440	Fundamental of Environmental Engineering	2	1	0	3
2.	BAM - 315	Elements of economics & principals management science	3	1	0	4
3.	CE – 605	Engineering Geology	2	1	0	3
4.	SWLE-408	Water Resources Engineering-I	2	1	0	3
5.	ME-503	Heat and Mass Transfer	3	0	1	4
6.	CE – 522	Health Safety and Environment	3	0	0	3
7.	SWLE-517	Land and Water Management & Engineering	4	0	0	4
8.	SWLE-607	GIS and Remote Sensing	2	0	1	3
9.	CE-400	Training I	0	0	1	1

Semester – VI

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	CE – 523	Transportation Engineering	2	1	0	3
2.	CE – 524	Air Pollution Control Engineering	2	1	1	4
3.	CE-525	Solid Waste Engineering and Management	2	1	0	3
4.	CE – 526	Wastewater Engineering and Management	3	0	0	3
5.	CE –527	Water Pollution	2	1	1	4
6.	CE –528	Fossil fuel Engineering	2	0	0	2
7.	CE –529	River Engineering	3	0	0	3
8.	CE –530	Industrial Waste water Treatment	3	0	0	3
9.	CE –580	Seminar -I	0	0	1	1

Note: Four Weeks Practical summer training-2 after VI Semester (to be evaluated in VII Semester)

Semester – VII

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	CE – 608	Environmental Modeling & Simulation	3	0	1	4
2.	CE – 609	Coastal Zone Management	3	1	0	4
3.	CE – 610	Noise Pollution	3	0	1	4
4.	CE – 611	Environmental Project management	3	1	0	4
5.	CE –612	Industrial Process and Environment pollution	3	1	0	4
6.	SWLE-516	Water Resource Engg.-II	2	1	0	3
7.	CE – 699a	Project (Project Formulation)	0	0	2	2
8.	CE – 680	Seminar - II	0	0	1	1
9.	CE-500	Training II	0	0	1	1

Semester – VIII

S.No	Course code	Course title	Credit			
			L	T	P	Total
1.	CE-614	Environmental Impact Assessment-II	3	0	0	3
2.	CE-615	Solid & hazardous waste management	4	0	0	4
3.	CE-616	Environment Risk Management	4	0	0	4
4.	CE-617	Advanced Waste Water Treatment	3	0	0	3
5.	CE-618	Environmental Policy and Legislation	3	0	0	3
6.	CE-699b	Project (Project Execution & Report)	0	0	6	6

MORAL & VALUE EDUCATION

Course Code GPT- 301

Credit-2[2-0-0]

My country and my people – the Indians, being and becoming an Indian, Nationalism and Internationalism. Some life issues – Love, Sex and marriage;

Men and Money - value of time, meaning of work, human communication, human suffering, addiction, ecology, women's issues.

Understanding one's neighbor - neighbor hood groups, their structure and functions, patterns of social interaction of group dynamics.

Preparation for career-choice of vocation, motivation for study and research, the present education system, curriculum and syllabus, teaching method, examination and work experience.

Definition of value education, Moral and Ethics, Laws and Moral based on Ten Commandments and two great commandments.

Discovery of self, Self-awareness, Growth of intellect- Man's spiritual nature, emotions, will, respect the rights of life, liberty, property, truth, reputation.

Sin, Origin of sin, manifestation of sin, the results of sin, the remedy of sin, sin as an act, sin as a state, sin as a nature.

Consciences – as defined in Oxford dictionary and Winston Dictionary, types of consciousness (such as evil, convicted, purged, pure, weak, good, void of offence).

PROFESSIONAL COMMUNICATION –1

Course Code LNG-302

Credit- 3[3-0-0]

Study of selected Literacy Texts – Collection of short essays, Collection of short stories.

Testing Written Comprehension Ability - Comprehension Passages of 500 words, Multiple Choice Questions.

Composition & Grammar - Report Writing, Characteristics of Business Reports.

Structure of reports: Front Matter, Main Body, and Back Matter

Style of Reports: Definition, the Scientific Attitude, Readability of Reports, Choice of Words and Phrases, Construction and length of sentences, Construction and length of Paragraphs. The lineout or break up of a format report Blank Form Report, Frogen Report, Memoranda Form Report, Periodic Report, and Miscellaneous Report.

Speech Drills - Using the language laboratory to develop Speaking Communication Skills.

Word Accent: Production of correct accentual patterns involving two and three syllabi words.

Rhythm: Stress-tone rhythm in sentences.

Intonation: Rising Tone and Talking Tone Ear Training and Production Tests.

References:

1. Close R.A.: A University Grammar of English Workbook.
2. Longman, London, 1998.
3. Jones, Daniel: English Pronouncing Dictionary, ELBS, and London, 1999.
4. Sharma S.D: A Textbook of Spoken and Written English, Vikas, 1994.
5. Alvarez, Joseph A.: The Elements of Technical Writing, New York: Harcourt, 1998.
6. 5.Bansal, R.K.: Spoken English For India, Orient Longman, 1993

WORKSHOP PRACTICE & TECHNOLOGY

Course Code ME-304

Credit -4[2-0-4]

1.Introduction

Classification of manufacturing processes, Primary shaping process, Machining processes, Joining processes, Surface finishing processes, Plant & Shop layout, Industrial Safety.

2. Properties of Metals

Strength, Elasticity, Stiffness, Plasticity, Malleability, Ductility, Brittleness, Toughness, Hardness, Impact strength, Fatigue, Creep.

3. Classification of Metals

Wrought iron, Cast iron, Grey cast iron, White cast iron, Nodular cast iron, Alloy cast iron, Steel, Mild steel, Medium Carbon steel, High carbon steel and its application. Effect of alloying elements on steel, Special alloy steels, e.g. stainless steel, high speed steel, cutting alloys.

4. Non-ferrous Metals

Aluminium, Copper, Zinc, Lead, Tin, Nickel, Non-ferrous alloys, Brass, Bronze.

5. Carpentry Shop

Introduction, Selection of timber, Seasoning of Timber, Common defects in timber, Preservation of timber, Auxiliary materials used in carpentry, Veeners and Veneering, Plywood, Wood working hand tools, Marking and measuring tools, Holding & Supporting tools, Cutting tools, Saws, chisel, Planers, Boring tools, Wood working processes, Joinery work classification of joints.

6. Bench Working & Fitting Shop

Introduction, Vices, Vice blocks, Surface plates, Trisquare, Bevel square, Combination set files, Chisel, Hacksaw, Surface gauge, Universal surface gauge, Punches, Calipers, Dividers, Pliers, Spanners, Drills taps. Die and die stock. Screw pitch gauge, Wire gauge, Dial indicator, Bench working processes.

7.Welding Shop

Concept of welding, Resistance welding, Spot welding resistance butt and flash welding, Resistance projection welding and seam welding, Electric arc welding, Gas welding (Oxy-Acetylene welding), Equipments and process, welding joints and positions of welding.

8. Sheet Metal Shop

Introduction, Metals used in sheet metal shop hand tools, Sheet metal operations.

List of practical:

1. To make a T-lap carpentry joint.
2. To make the wooden block of given size with the help of planning - to make a square slot, to make a semi circular arc.
3. To make an S-hook.
4. Metal practice- Filing, hack sawing, drilling, tapping.
5. To make a book stand.
6. To make a butt joint with the help of electric arc welding.
7. To make a lap joint with the help of electric arc welding.
8. To study and sketch the Lathe Machine.

ENGINEERING GRAPHICS –I

Course Code ME-301

Credit -2[0-0-4]

Introduction:

Graphics as a tool to communicate ideas, engineering drawing instruments and its uses. Lettering and dimensioning, scales, layouts of drawing sheets Construction of geometrical figures like pentagon and hexagon.

Orthographic Projection:

Principles of orthographic projections, Principal and auxiliary planes, First and Third angle projections. Projection of points. Pictorial view.

Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems.

Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other Plane, Solids lying on a face or generator on a plane.

Sectioning of solids lying in various positions, True shape of the section.

Development of lateral surfaces, sheet metal drawing.

Isometric Projection:

Principles of isometric projection, Isometric projection using box and offset methods.

References:

Bhatt N.D.: Elementary Engineering Drawing, Charoathar Publishing.
Laxmi Narayan V & Vaish W.: A Text Book of Practical Geometry on Geometrical Drawing.

ENGINEERING THERMODYNAMICS

Course Code ME-408

Credit- 3[2-0-2]

Thermodynamics:

Fundamental Concepts and Definitions:

Introduction to SI units, Definition of thermodynamics, System, Surrounding and universe, Phase, Concept continuum, Macroscopic and Microscopic point of view, Density, Sp. Volume, Pressure, Thermodynamic equilibrium, Property, State, Path, Process, Cyclic process, Quasi-static process, Reversible and irreversible process, Energy and its forms, Work and head, NTP and STP.

Ideal and Real Gases:

Concept of ideal gas, characteristic equation of gas. Universal and characteristic gas constant. Enthalpy and specific heat, Deviation of real gas from ideal gas, compressibility factor and the Van der Waall's equation of state for real gas.

Laws of Thermodynamics

Zeroth Law: Concept of temperature. Equality of Temperature, Zeroth law, Principle of thermometry and temperature scale.

First Law: First Law of thermodynamics. Concept processes, Flow processes and control volume, Flow work, Steady flow energy equation, Mechanical work in a steady flow process, Throttling process, Application of first law to open systems.

Second Law: Essence of second law. Thermal reservoir. Heat Engines and thermal efficiency, COP of heat pump and refrigerator. Definition of available and unavailable energy, Statement of second law, Carnot cycle, Carnot's theorem, Clausius inequality, Concept of Entropy, Entropy change for ideal gases.

Properties of steam:

Generation of steam at constant pressure. Various states of water, Properties of steam, Use of property diagram, Process of vapour in closed and open system, Determination of dryness fraction of steam by separating and throttling Calorimeter, Rankin cycle.

Thermodynamic Cycles:

Definitions of bore, Stroke clearance ratio, Compression ratio, Definition and calculation of mean effective pressure from the cycle work (proof not required), Indicated pressure, Air standard cycles (Otto and Diesel cycles), Principle of working and description of two and four stroke SI and CI engines.

ENGINEERING MECHANICS

Course Code CE-401

Credit 3[2-1-0]

Force and Equilibrium: Basic concepts, Force, Moment and couple, Principle of Transmissibility, Varignon's theorem, Resultant of Force Systems concurrent and Non-concurrent coplanar Forces, Funicular polygon. Free body diagram.

Trusses: Plane structures, Various methods of analysis of Trusses, Method of joints, Method of sections and Graphical method.

Moment of Inertia: Center of gravity, centroids of Line, Area, volume and Composite Bodies, Area Moment of Inertia and Mass Moment of Inertia for plane figures and bodies including composite bodies, Product Moment of inertia, Parallel axis theorem, Principal moment of inertia.

Friction: Introduction, Dry friction, Co-efficient of static friction. Friction cone, screw jack and Belt friction.

Beams: Bending moment and shear force diagrams for statically determinate beams.

Kinematics of Rigid Bodies: Plane motion, Absolute motion, Relative motion, Translating axes and Rotating axes.

Kinetics of Rigid Bodies: Plane motion, Force Mass and Acceleration, Work and energy, Impulse and momentum, Principles of energy conservation, Principle of virtual work, D'Alembert's principle and Dynamic equilibrium.

References:

Beer F.P and Johnston F.R: Mechanics for Engineers, McGraw Hill.

Meriam, J.L: Statistics, John Wiley.

Meriam, J.L: Dynamics, John Wiley.

Shames I.H: Engineering Mechanics, Prentice Hall of India.

Dayaratnam, P.: Statistics, Tata Mc Graw Hill.

Timoshenko, S. and Ypung D.: Engineering Mechanics, Mc Graw Hill.

ENGINEERING PHYSICS

Course Code PHY-312

Credit- 5[3-1-2]

Special Theory of Relativity:

Michelson Morley experiment, Inertial frames of reference, Postulates of special theory of relativity, Lorentz transformation equation of space and time, length contraction, time dilaton, addition of velocities, variation of mass with velocity, mass-energy equivalence.

Optics :

Interference: Coherent sources, Conditions of interference, Fresnel's bi-prism experiment, displacement of fringes, interference in thin films, wedge shaped film, Newton's rings.

Diffraction: Single slit and double slit diffraction, diffraction grating, Reyleigh's criterion of limit of resolution, resolving power of telescope, microscope and grating.

Polarization: Polarization of light, Pictorial representation of polarized light, Brewster's law, Malus law, Phenomena of double refraction, Geometry of calcite crystal, Optical activity, Specific rotation, Polarimeter.

Fields:

Scalar and vector fields, Gradient of a scalar field, divergence and curl of a vector field, line integral, conservative vector field, Gauss' Divergence theorem, Stoke's theorem.

Electrostatics:

Gauss' law and its applications, Poisson and Laplace equations. Maxwell's equations, Basic Concepts of Electromagnetic waves and its solution in free space.

Magnetic Properties of Materials:

Para, dia, ferro, antiferro and ferro-magnetic materials, hysteresis, Methods of plotting hysteresis curve of a ferro-magnetic material and their uses, magnetic circuits.

X-Rays:

Origin of X-rays, Continuous and characteristic X-Ray spectra, Moseley's law, Absorption of X-rays, Diffraction of X-rays, Bragg's law, Bragg's spectrometer, Practical application of X-rays, Compton effect.

Quantum Theory:

Wave particle duality, De Broglie concept of matter waves, Davisson and Germer experiment, Heissenberg's uncertainty principle, Schrodinger wave equation and its applications.

Laser:

Spontaneous and stimulated emission of radiation, Einstein's coefficients, Main components of a laser, types of lasers and their applications.

References:

1. Arthur Beiser: Concepts Of Modern Physics, TMH.
2. Subramanyam & Brij Lal: A Text Book of Optics, S. Chand & Co.
3. K.K. Tiwari: Electricity & Magnetism, S. Chand & Co.
4. Brij Lal & Subramanyam: Electricity & Magnetism.
5. Wehr, Richardo & Adair: Physics of the Atom.

ENGINEERING M A T H E M A T I C S – I

Course Code (MAS-411)

Credit 4(3-1-0)

1. **Matrices** :Elementary row and column transformations, Linear dependence, Rank of matrix, Consistency of system of linear equations and solution of linear equations, Characteristic equation, and Caley-Hamilton theorem, Eigen values and eigen vectors, Diagonalisation, Complex and unitary matrices.
2. **Differential Calculus-I:** Leibnitz theorem, Partial differentiation, Euler's theorem, Asymptotes, Curve tracing, Change of Variables, expansion of functions of one and several variables. Cylindrical and spherical coordinate systems
3. **Differential Calculus-II:** Jacobian, Approximation of errors, Extrema of function of several variables, Lagrange's method of multipliers (simple applications).
4. **Multiple integrals:** Double and triple integrals, change of order, change of variables, Gamma & Beta functions,application to area, volume, Disrichlet's integral and its applications.
5. **Vector Calculus:** Point functions, Gradient, divergence and curl of a vector and their physical interpretations, line, surface & volume integrals, Gauss divergence theorem and Greens & Stokes theorem.

References:

1. Shanti Narayan: A Text Book of matrices, S.Chand & Co.
2. Thomas/Finney: Calculus and Analytic Geometry, Narosa Pub. House.

3. J. N. Kapur: Mathematical Statistics, S. Chand & Co.
4. C. Prasad: Mathematics for Engineers, Prasad Mudranalaya.
5. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers.
6. Jaggi & Mathur : Advanced Engineering Mathematics, Khanna Publishers.
7. Piskunov, N.: Differential & Integral Calculus, Moscow Peace Pub.
8. H.K. Das, Engineering Mathematics.
9. Vijai Shankar Verma & Sanjeev Kumar, Engineering Mathematics.
10. Rakesh Dubey, Engineering Mathematics

PROFESSIONAL COMMUNICATION –II

Course Code LNG-303

Credit 3[3-0-0]

Technical Written Communication: Nature, origin and development of technical written communication, Salient Features, Difference between technical writing and general writing.

Pre-requisites of Scientific and Technical Communication: Fragment sentences, Parallel comparisons, Elements of a series, Squinting construction and split infinitive, Modifiers, connectives, antecedents and clause subordination, Dangling participles and gerunds.

Ellipsis, Coherence, Unity, Chronological method, spatial method, inductive method, linear method, deductive method, interrupted method.

Business Correspondence: General principles of business correspondence.

Ramifications of business letters. Letters giving instructions, inquiries and answers to enquiries, complaints and adjustments, letters urging action, employment letters, application and resumes.

Proposal Writing: Proposal: Definitions and kinds, Division of format proposals (front matter, title page, summary/ abstract, Table of contents etc.)

Statement of request, body- statement of problem, background, scope, methodology, Advantages and disadvantages.

Writing Scientific and Semi-technical Articles: Source material, topic sentence, literature review. Tables, figures, footnotes, bibliography.

Study of Scientific and General Texts: Prescribed text books for detailed study

Arora, V.N (et. al.), Improve your writing (Delhi: Oxford University Press, 1981.

Lesson No. 1.2, 1.6, 2.4, 3.5, 4.1, 4.3, 5.1, 5.4, 6.2.

For extended Reading (any one of the following)

Orwell George, Nineteen Eighty Four (New York: Penguin, 1984)

Hemingway, Ernest, The old man and the Sea, (Oxford: 1990)

Listening Comprehension:

(a) Ear-training.

(b) Uses of latest scientific techniques (AVR Comprehension trainer, SRA Comprehension trainer, SRA Comprehension Accelerator, AVR Comprehension Reteometer.)

Reading Comprehension:

(a) Scanning method.

(b) Skimming method.

Phonetic Transcription:

Stresses and Intonation:

References

1. Sherman, Theodore A. (et al) Modern Technical Writing, New Jersey, Prentice Hall, 1991.
2. Legget, Glenn (et al) Essentials of grammar and composition, Macmillan, Delhi 1994.
3. Strunk, Jr. William (et al), The elements of style, Macmillan, 1987.
4. Sharma, S.D A Text Book of Scientific and Technical Writing, Vikas, Delhi, 1990.

ENGINEERING CHEMISTRY

Course Code CHEM-513

Credit-5[3-1-2]

General Chemistry:

Advanced Theory of Chemical Bonding: Valence bond and molecular orbital theory. Structure of NH₃, H₂O, SO₃, PCl₅, XeO₂ molecules. Theories of bonding in metals and semiconductors, n-type and p-type semiconductors, Imperfections in materials. Born-Haber cycle, Bragg's conditions.

Physical Chemistry:

Equilibrium on Reactivity: Bronsted and Lewis Acids, pH, p_Ka, p_Kb Scale, Buffer solution. Stereochemistry of organic compounds, Co-ordination chemistry, Nomenclature, Valence Bond and crystal field theory.

Chemical Kinetics & Catalysis: Rate law, Order of reactions, Parallel and reversible reactions, Catalysis, Homogeneous and heterogeneous catalysis, Characteristics of catalytic reaction, Catalytic promoters and poisons, Auto catalysis and negative catalysis, Intermediate compound formation theory and absorption theory.

Environment Chemistry:

Atmospheric Chemistry & Air Pollution: Environment and Ecology, Environmental segments, Structure and composition of atmosphere, Radiation Balance of Earth and Green House Effect, Formation and depletion of Ozone layer, Chemical and photochemical reactions of various species in atmosphere, Air pollution – sources, reactions and sinks for pollutants, Acid rains and Smog formation. Pollution control methods.

Corrosion and Lubrication: Introduction, causes of corrosion, Theories of corrosion, Factors influencing Corrosion, Corrosion inhibitors, passivity, Types of corrosion, Protection from corrosion and protective coatings. Theory, Classification and mechanism of Lubrication.

Applied Chemistry:

Water and Waste Water Chemistry: Introduction, Hardness of water, characteristics imparted by impurities, Analysis of contaminants, Treatment of Water by Zeolite, L-S process, Boiler feed water, Waste water treatment.

Chemistry of Engineering Materials:

Fuels & Combustion: Classification of fuels, Non conventional Energy, Biogas, Biomass and solar energy. Calorific value- gross and net, characteristics of good fuel, Determination of calorific value, Solid fuels, Analysis of coal, Liquid fuels.

Instrumentation: IR, UV, NMR, MASS AND ASS.

Industrial Chemistry:

Polymer Chemistry: Classification of Polymers, Including Biopolymers condensation and addition polymers and their applications. Industrial

Application and mechanism of chemical reaction, Beckman, Hoffman, Reimer Tiemann, Cunnizzaro, Diels Alder and Skraup synthesis

References:

1. Puri and Sharma/Principles of Physical Chemistry.
2. Manas Chandra/Atomic Structure and Chemical Bond.
3. Bahl and Tuli /Engineering Chemistry.
4. Jain and Jain/A Text-Book of Engineering Chemistry
5. S.S Dara/Environmental Chemistry and Pollution Control.
6. S.S Dara /Environmental Chemistry.
7. A.K De/Environmental Chemistry.

List of Experiments: (Any Ten):

1. To determine the percentage of available chlorine in the supplied sample of Bleaching powder.
2. To determine the Ferrous content in the supplied sample of iron ore by titrimetric analysis against standard $K_2Cr_2O_7$ solution using $K_2Fe(CN)_6$ as external indicator.
3. To determine the chloride content in supplied water sample using Mohr's method.
4. To determine the constituents and amount of alkalinity of the supplied water sample.
5. To determine the Temporary and Permanent hardness of water sample by Coplexometry.
6. To find the Chemical Oxygen Demand of a waste water sample using Potassium dichromate.
7. To determine iron concentration in the sample of water by spectrophotometric method.
8. To find out the Velocity constant for the inversion of cane sugar in acidic medium and to show that inversion follows the first order kinetics.
9. To determine the Molecular weight of a polystyrene sample by using Viscometer method.
10. To determine pH of a solution using a pH-meter and titration of such a solution pH-metrically.
11. To determine the calorific value of a fuel sample by using a Bomb Calorimeter.
12. Analysis of a coal sample by proximate analysis method.
13. References:
14. Vogel's Qualitative Chemical Analysis: Ed. By Jaffery Bassette et. al. (ELBS).
15. Applied Chemistry- Theory and Practice, 2nd Ed. By Virmani and Narula (New Age International Pub.).
16. Experiments in Engineering Chemistry, Ed. By Masood Alam (Maktaba Jamia Limited).

COMPUTER & LANGUAGES

Course Code COMP-410

Credit- 4[2-1-2]

Computer hardware components and their functions. Basic operating system concepts, MS-DOS and getting to know DOS commands, Familiarizing with WINDOWS environment, Getting started with UNIX, Files and Directories and their use in different Operating System Environments, Getting to know different editors like edit & vi Introduction to Internet. Getting familiar with Web Browsers like Netscape Navigator & Internet Explorer

Sending & receiving mail over Internet, Introduction to PINE and /or ELM, Need of programming languages. Language translators. Introduction to “C” language, Data types operators and expressions. Conditional & looping statements. Function & Arrays. Introduction to Pointers & Structures.

References:

1. DOS the complete reference by Kris Jamsa, Tata- McGraw Hill Publication.
2. UNIX POWER TOOLS by J.Peeck Tim O’reilly & M. Locekides, BPB Publication.
3. The ‘C’ Programming Language by B.W Kernighan & D.M Ritchie, Prentice Hall of India.
4. Using LINUX- Latest Edition by Jade Tackett & David Ganter, Prentice Hall of India.

List of Experiments:

1. Basic Internal and External DOS Commands.
2. Write a simple batch program.
3. Giving exposure to Windows environment.
4. File and program management in windows.
5. Practice of basic UNIX commands.
6. Write simple shell script.
7. Introduction to word processing.
8. Exposure to advance feature supported by some editors.
9. Net Surfing.
10. Creation and checking of E-mail account.
11. Write C program to demonstrate each of the following:
12. Conditional statements.
13. Looping statements.
14. User defined functions.
15. Arrays.
16. Pointers and structures.
17. Familiarizing mail account using PINE, deleting, creating folder/mail-messages, adding signature, creating director of addresses.

Note: List may be modified according to new software available.

ENGINEERING GRAPHICS –II

Course Code ME-405

Credit-2[0-0-4]

Introduction: Graphic language, Classification of drawings, Principles of drawing: IS codes for Machine drawing, Lines, Sections, Dimensioning, Standard abbreviation.

Orthographic Projections: Principles of first and third angle projections, drawing and sketching of machine elements in orthographic projections, spacing of views.

Screwed (Threaded) Fasteners: Introduction, Screw thread nomenclature, Forms of threads, Thread series, Thread designation. Representation of threads, Bolted joints, Locking arrangements for nuts, Foundation bolts.

Keys and Cotters: Keys, Cotter joints.

Shaft Couplings: Introduction, Rigid and flexible coupling.

Riveted Joints: Introduction, Rivets and riveting, Rivet heads, Classification of riveted joints.

Assembly Drawing: Introduction, Engine parts, Stuffing box etc.

Free Hand Sketching: Need for free hand sketching, Free hand sketching of some threaded fasteners and simple machine components.

References:

N. Siddeshwar, P. Kanniah, V.V.S Shastri: Machine Drawing, TMH, New Delhi.

K.L. Narayana, P. Kanniah, K. VenkatReddy: Machine Drawing, New Age International Publications, 2nd edition.

Engineering drawing practice for schools and colleges, SP 46-1998(BIS).

ENGINEERING MATHEMATICS – II

Course Code MAS-490

Credit-4[3-1-0]

Integral Transforms: Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and application to simple heat transfer equations.

Z transform and its application to solve difference equations.

Functions of a Complex Variable-I:Analytic functions, Cauchy-Riemann equations and Harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula derivatives of analytic functions, Liouville's Theorem, Fundamental theorem of algebra.

Functions of a Complex Variable-II:Representation of a function by power series, Taylor's series and Laurent's Series, Poles, Singularities and zeroes. Residue theorem, evaluation of real integrals of type $\int f(\cos\theta, \sin\theta) d\theta$ AND \int , Conformal mapping and bilinear transformations.

Probability and Statistics:Moments, Moment generating functions, skewness, kurtosis, Binomial distribution, normal distribution and poisson distribution, correlation and regression.

Solution Of Equations And Curve Fitting:Solution of cubic and bi-quadratic equations. Method of least squares and curve fitting.

References:

Kreuzig, E. (1993): Advanced Engg. Mathematics 7th Edition, John Willey & Sons inc.

Paopoulis: Signal Analysis 3rd Edition (1998) McGraw Hill

Engineering Mathematics Volume II

By H.K.Das.

Publication: S.CHAND

H.K. Das, Engineering Mathematics.

Vijai Shankar Verma & Sanjeev Kumar, Engineering Mathematics.

BASIC ELECTRONICS

Course Code ECE-301

Credit - 4[2-1-2]

Energy Bands in Solids: Energy band theory of solids, Concept of forbidden gap, Insulators, Metals and Semiconductors.

Transport Phenomenon in Semiconductors: Mobility and conductivity, electrons and holes in an intrinsic semiconductor, Donor and acceptor impurities, Fermi level, carrier densities in semiconductor, electrical properties of semiconductor, Hall effect, Diffusion.

Junction Diode: P-N junction, depletion layer, V-I characteristics, diode resistance, capacitance, switching time, diode application as a rectifier (half wave and full wave), diode circuits (clipper, clamper, voltage multipliers) Breakdown mechanism, Zener & Avalanche, breakdown characteristics, Zener diode and its applications.

Bi-junction Transistor: Bipolar junction Transistor, CE, CB and CC configuration, characteristic curves (cut off, active and saturation region), Requirement of biasing, biasing types and biasing analysis, stability.

Transistor as an Amplifier: Graphical analysis of CE amplifier, concept of voltage gain, current gain and power gain, h-parameter (low frequency), computation of A_v , R_i , R_o and approximate formulae.

Operational Amplifiers: Concepts of ideal op-amp, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, Integrators.

Switching Theory & Logic Gates: Number systems, conversion of bases, Boolean algebra, Logic Gates, concept of universal gate, canonical forms, and minimization using K-map.

Electronic Instruments: Multimeter, CRO and its Applications.

References:

1. Boylestad & Nashelsky/Electronic Devices & Circuits/ PHI.
2. Morris Mano/Digital Computer Design/ PHI.
3. Milliman, J. Halkias/Integrated Electronics/TMH.
4. Malvino & Leach/Digital Principles & Application/

List of Experiments:

1. Study of Diode characteristics.
2. Study of Common Base Transistor characteristics.
3. Study of Common Emitter Transistor characteristics.
4. Study of Half Wave Rectifier with effect of Capacitor and also calculate the ripple factor.
5. Study of Full- Wave Rectifier with effect of Capacitor and also calculate the ripple factor.
6. Study of Various Logic Gates.
7. Study of Clipping and clamping Circuits.
8. Study of C.R.O., Function generator, Multimeter.

ELECTRICAL ENGINEERING

Course Code EEE-303

Credit-4[3-0-2]

Sinusoidal Steady State Circuit Analysis: Voltage, Current, Sinusoidal & Phasor representation. 1-Phase A.C. Circuit-behavior of resistance, Inductance and Capacitance and their combinations, impedance, concept of power, power factor, series & parallel resonance-bandwidth and quality factor.

Network Theory: Introduction to basic physical laws, Network theory: Superposition, Thevenin, Norton, Maximum Power transfer theorems, Star-delta transformation, Circuit theory Concepts: Mesh and Nodal analysis.

Three Phase Supply: Star/delta connections, line and phase voltage/current relations, Three-phase power and its measurement.

Basic Instruments: Instruments for measurement of voltage, Current, power and energy: Construction, principle and application.

Magnetic Circuit and Transformer: Magnetic circuit concept, theory and working principle of single-phase transformer.

Rotating Machines: Principles of energy conversion, Basic concepts of rotating machines, DC machines, Different types and their characteristics & applications. Elementary idea of operation of synchronous and induction machines. Single-phase induction & stepper motors, Applications.

Power Systems: Introduction, Elements, Line diagram, Supply systems, Power factor improvement.

Reference:

1. V. Del Toro/ Principles of Electrical Engineering/ PHI.
2. W.H Hayt & J.E Kennedy/ Engineering Circuit Analysis/ McGraw Hill.
3. I.J Nagrath/ Basic Electrical Engineering/ Tata McGraw Hill.
4. A.E Fitzgerald/ Electronic Instruments & Measurement Techniques/ PHI.
5. Higginbotham L.Gabel/Basic Electrical Engineering/ McGraw Hill.

List of Practical's:

1. Verification of Thevenin's Theorem.
2. Verification of Superposition Theorem.
3. Verification of Norton's Theorem
4. Verification of Kirchoff's Law.
5. To measure the value of impedance and power factor in RLC series A.C. circuit.
6. To measure the value of impedance and power factor in RLC parallel A.C.
7. To study resonance by frequency variation in series RLC circuit.
8. To calibrate the given energy meter with the help of a standard wattmeter.
9. To find the relation between line current and phase current and line voltage and phase voltage in Star – Delta connections.
10. To perform open circuit and short circuit test and draw the equivalent circuit of a single-phase transformer.
11. To measure three phase power by two-wattmeter method.
12. To draw the magnetizing characteristic of a single-phase transformer.

ENGINEERING PHYSICS-II

Course code: PHY- 312

Credit 4(3-0-1)

Unit-1:

Wave Mechanics and X-ray Diffraction:

Wave- particle duality, de- Brogie matter waves, Phase and group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrodinger's wave equation- particle in one dimensional box. Diffraction of X-rays by crystal planes, Bragg's spectrometer, Compton's effect.

Unit-11:

Dielectric and magnetic properties of Materials:

Dielectric constant and polarization of dielectric materials, Types of polarization (Polarizability). Equation of internal fields in liquid and solid (one- Dimensional), Claussius musstoti- Equation, Ferro and Piezo electricity (Qualitative), Frequency dependence of dielectric constant, Dielectric losses, Important applications of dielectric material. Langevin's theory for dia and paramagnetic material, phenomenon of

hysteresis and its applications. Ultrasonic: Generation, detection, and application of ultrasonics.

Unit-III :

Electromagnetics:

Displacement Current, Maxwell's Equations (Integral and Differential Forms). Equation of continuity, E-M wave equation and its propagation characteristics in free space and in conducting media, pointing theorem and pointing vectors.

Unit-IV:

Superconductivity and Science and technology of non materials:

Temperature dependence of resistivity in superconductivity material, Effects of magnetic field *(Meissner effect), Type-I and Type-II superconductors, Temperature dependence of critical field, BCS theory (Qualitative) ,High temperature superconductors in superconducting state, Applications of Super-conductors.

Introduction to Nanomaterials- Basic principle of nanoscience and technology, creation and use of buck balls, structure, properties and use of carbon nanotubes, Application of nanotechnology.

Reference books:

1. Engineering Physics: Srivastava / Yadav
2. Physics for Engineers – II : Narinder Kumar
3. Introduction to Engineering Physics – II : A. S. Vasudeva
4. Engineering Physics: Satya Prakash
5. Text book of Engineering Physics – II: Gupta/Kumar
6. Engineering Physics: Uma Mukherji

ENVIRONMENTAL STUDIES – I

Course Code SES-415

Credit -2[2-0-0]

The Multidisciplinary Nature of Environmental Studies. Definition, Scope and Importance.

(i) Ecosystems.

Concept of an Ecosystem.

Structure and function of an Ecosystem.

Producers, consumers and decomposers.

Energy flow in the ecosystem.

Ecological succession.

Food chains, food webs and ecological pyramids.

Introduction, types, Characteristics features, structures and function of the following ecosystem:

(a) Forest Ecosystem.

(b) Grassland Ecosystem.

(c) Desert Ecosystem.

(d) Aquatic Ecosystem (Ponds, streams, lakes, rivers, oceans, estuaries).

(ii) Social Issues and the Environment

From unsustainable to sustainable development.

Urban problems related to energy.

Water conservation, rain water harvesting, water shed management.

Resettlement and rehabilitation of people; its problems and concerns case studies.

Environmental ethics: Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies

Wasteland reclamation.

Consumerism and waste products.

Environment Protection act.

Air (Prevention and Control of Pollution) Act

Visit to local polluted site-Urban/Rural/industrial/Agricultural.

Study of Common plants, insects, birds.

Study of simple ecosystems-ponds, river. Hillslopes etc(Field work equal to 5 lecture hours).

Issues involved in enforcement of environmental legislation; public awareness.

List Of Experiments:

- (1) Visit to different polluted sites to assess their effect on pollution, monitoring of pollutant in ecosystem.
- (2) Study of simple ecosystem-ponds, rivers, Hill slopes.
- (3) Study of common plant, insects, (Herbarium file/insect box)
- (4) Visit of local polluted site-Urban/Rural/Agricultural/Industrial
- (5) To study the different purification of industrial effluents and wastes.

MATHEMATICS – III ***Course Code MAS 590****Credit -4[3-1-0]****Integral Transforms**

Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and application to simple heat transfer equations.

Z transform and its application to solve difference equations.

Functions of a Complex Variable-I

Analytic functions, Cauchy-Riemann equations and Harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula derivatives of analytic functions, Liouville's Theorem, Fundamental theorem of algebra.

Functions of a Complex Variable-II

Representation of a function by power series, Taylor's series and Laurent's Series, Poles, Singularities and zeroes. Residue theorem, evaluation of real integrals of type $\int f(\cos\theta, \sin\theta)d\theta$ AND $\int \dots$, Conformal mapping and bilinear transformations.

Probability and Statistics

Moments, Moment generating functions, skewness, kurtosis, Binomial distribution, normal distribution and poisson distribution, correlation and regression.

Solution Of Equations And Curve Fitting

Solution of cubic and bi-quadratic equations. Method of least squares and curve fitting.

References:

Kreuzig, E. (1993): Advanced Engg. Mathematics 7th Edition, John Wiley & Sons inc.

Paopoulis: Signal Analysis 3rd Edition (1998) McGraw Hill

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FOUNDATION OF INFORMATION TECHNOLOGY**Course Code COMP 510****Credit -5[2-1-4]**

Fundamental Concept of Information, Concept and Processing :Definition of Information, Need of Information, Quality of Information, Value of Information, concept of Information, Entropy Category and Level of Information in Business Organization, Data Concepts and Data Processing, Data Representation.

Information Representation: Information Contents, Introduction to Information Representation in Digital Media, Elementary Concepts in Information Perseverance, Data Compression, LZW Coding, Text, Image Compression, Introduction to JPEG, MPEG, MHEG.

Computer and Programming, Computer Appreciation: Definition of Digital Computer, History, Generations, Characteristics and Application of Computers, Computer Hardware, RAM and ROM, CPU, Various I/O Devices, Storage Media, Software Definition.

Programming Language Classification & Program Methodology: Computer Language, Generations of Languages, Software Development Methodology, Life Cycles, Software Coding, Testing, Maintenance, Industry Standards, Introduction to ISO, SEI-CMM Standards for IT Industry.

Digital Devices and Basic Network Concepts, Digital Fundamentals: Various Codes, Decimal, Binary, Hexa Decimal Conversion, Floating Numbers, Gates, Flip Flops, Adder, Multiplexers.

Computer Networks and Communication: Need for Data Transmission over Distances, Types of Data Transmission, Media for Data Transmission, Introduction to Computer Networks, Network Classification and Network Topologies.

Internet and Web Technologies, Internet & World Wide Web: Hypertext Markup Language, DHJML, WWW, Gopher, FTP, Telnet, Web Browsers, Net Surfing Search Engines, Email, Basic Concepts in E-Commerce, EDI, Electronic Payments, Digital Signatures, Network, Security, Firewall.

Web Technologies: HTML, DHTML, XML, Java Script, WAP, WML, JSP, ASP.

Advanced Concepts In Information Technology, IT Industry Trends, Careers and Applications in India: Scientific, Business, Educational and Entertainment applications, Industry Automation, Weather forecasting awareness of ongoing IT projects in India, NICNET ERNET, Application to E- Commerce, Electronic Governance, Multimedia, and Entertainment.

References:

Curtin, "Information Technology: Breaking News", TMH.
RajaRaman, V. "Introduction To Computers".
Bajpai, Kushwaha & Yadav, "Introduction To Computer & C Programming", New Age.
Nelson, "Data Compression", BPB.
Bharohoke, "Fundamentals of Information Technology", Excel.
Peter Nortans "Introduction To Computers", TMH.
Leon & Leon "Fundamental of Information Technology", Vikas.
Kanter, "Managing Information System".
Lehngart, "Internet 101", Addison Welsley.
Cistems "Internet, An Introduction", Tata McGraw Hill.

FLUID MECHANICS – I

Course Code CE 405

Credit -5[3-1-2]

Introduction: Fluids and continuum; Physical properties of fluids: Viscosity, Compressibility, Surface Tension, Capillarity, Vapor Pressure; Cavitation; Classification of fluids including rheological classification.

Fluid Statics: Pressure at a point, Pascal's law; Pressure-density-height relationship; Measurement of pressure by Manometers and mechanical gauges; Pressure on plane and curved surfaces; Total Pressure and Centre of pressure; Buoyancy; Stability of immersed and floating bodies; Fluid masses subjected to linear accelerations and fluid mass subjected to rotation about the vertical axis.

Dimensional Analysis: Units and Dimensions, Dimensional analysis, Rayleigh's method, Buckingham's Π theorem, important dimensionless numbers used in fluid mechanics and their significance. Hydraulic Similitude and Model Studies: Model and prototype; Similitude; Geometric, Kinematic and Dynamic similarity.

Fluid Kinematics: Types of fluid Flows; Stream lines, Path lines and Streak lines; Stream tube; Acceleration of a fluid particle along a straight and curved path; Differential continuity equation for 3 D flows; Integral form of Continuity equation for one dimensional flow; Stream function and Velocity potential; Flow net characteristics and uses; kinetic energy and momentum correction factor; circulation.

Fluid Dynamics: Concept of control volume and control surface, Reynolds Transport Theorem, Introduction to Navier-Stokes Equations, Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Flow through orifices, Mouthpieces, Weirs; Flow measurement in pipes, momentum equation, forces on pipe bend; Angular momentum equation and its applications.

Laminar Flow: Reynolds Experiment; Equation of motion for laminar flow through pipes; Flow between parallel plates.

Boundary Layer Analysis: Boundary layer thicknesses i.e. displacement, momentum and energy thickness; Boundary layer over a flat plate; Laminar boundary layer; Application of Von-Karman Integral Momentum Equation; Turbulent boundary layer; Laminar sub-layer; Boundary layer separation and its control; Forces on immersed bodies like 2d cylinder and sphere.

Flow Through Pipes: Nature of turbulent flow in pipes; Mixing length theory; Equation for velocity distribution over smooth and rough surfaces; Major and Minor energy losses; Resistance coefficient and its variation; Hydraulic gradient and total energy lines; siphons; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Simple pipe networks, water hammer.

REFERENCES:

Hunter Rouse: Elementary Mechanics of Fluids, John Wiley and sons, Omc/ 1946.
L H Shames: Mechanics of Fluids, McGraw Hill, International student edition.
K L Kumar: Engineering Fluid Mechanics
V. C. Agarwal: Fluid Mechanics, TPI Allahabad, 2006ed.

SURVEYING AND LEVELING

Course Code CE -402

Credit-4[2-0-4]

Introduction: Importance of surveying to Engineers –Examples from different fields; Plane and Geodetic Surveying, Control Points, Classification of surveys, Methods of locating a point, Sources and Types of errors, Principle of working from whole to part.

Measurement of Distances: Principle of different methods and their accuracy, Measurement by chain and tape. Sources of errors and precautions, Corrections to tape measurements, Field problems, Use and adjustment of auxiliary instruments, Introduction of modern trends: EDM and Total Stations.

Measurements of Angles and Directions : Compass Surveying: Reference meridians, Bearing and azimuths, Magnetic declination and its variations, Use and adjustment of compass. Theodolite Surveying: Vernier theodolite, micro-optic and electronic theodolites, Temporary and permanent adjustments, Measurement of horizontal and vertical angles.

Traversing: Principles of traversing by compass and theodolite, Field work and checks, Computation of coordinates, Sources of errors, Precision of traversing, Checking and adjusting of traverse, omitted measurements.

Tachometry : Definitions, Principles of stadia systems, Instrument constants, Subtense and tangential systems, Construction and use of Reduction Tacheometers, Errors and Precision.

Measurements of Elevation and Contouring: Different methods of determining elevation; Spirit levelling: Definition of terms, Principle, Construction, Temporary and permanent adjustments of levels. Automatic levels, Levelling staves, Methods of spirit levelling, Booking and reduction of field notes, Curvature and refraction, Reciprocal leveling, Construction and field use of altimeter, Trigonometric levelling-simple and reciprocal observations, Sources of errors and precision of levelling procedures. Methods of relief representations, Definition and characteristics of contours, Use of contour maps, Direct and Indirect methods of contouring, Digital Elevation Model.

Plane Table Surveying: Principle, Advantages and disadvantages, Plane Table equipment, Use of telescopic alidade and self reducing alidades, Different methods of Plane Table Surveying, Resection-Two and three point problems, Advantages and disadvantages of Plane Table surveying.

Sheet Numbering System : CIM and I & A C series, scales and numbering of Indian topographic maps.

References :

1. Agor, R. "Surveying", Vol. I & II Khanna Publications, Delhi,.
2. Arora, K.R., "Surveying" , Vol. I & II Standard Book House, Delhi,
3. Bannister, A. and Baker, R., "Solving Problems in Surveying", Longman Scientific Technical, U.K., 1994.
4. Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990.
5. Punmia, B.C., "Surveying", Vol. I & II, Laxmi Publications New Delhi,
6. Duggal, S.K., Surveying Vol. I & II TMH
7. Basak, Surveying TMH.
8. Kanetkar, Surveying Vol. I, II
9. Chandra, A.M. "Plane Surveying", New Age International Publishers, Delhi
10. Chandra, A.M. "Higher Surveying", New Age International Publishers, Delhi

Practical:

Handling of chain and chain accessories, offsetting, acquaintance with field book; Ranging out surveying line and plotting chain survey; Triangulation by chain and offsetting for details for preparation of map of a small area; Plotting of the field book reading for preparation of map acquaintance with symbols of different objects used in maps and scale of map; Setting up of prismatic compass and measurements of angles; Traversing of a small area with chains and prismatic compass and offsetting for details; Plotting of the above map; Setting up off a 20" accuracy transit Theodolite and measurement of horizontal angles and verticals angle; Setting up off a plain table and off setting by intersection method; Plain table traversing (5 sides); Setting up off a dumpy level and exercise in fly levelling and reciprocal levelling;

STRENGTH OF MATERIALS

Course Code CE-408

Credit- 3[3-0-0]

Simple Stresses and Strains: Stress- tensile and compressive, strain, strain energy, stress-strain diagram, ductile and brittle material, elastic constants, impact loading, varying cross-section and load, temperature stresses, shear stress, complimentary shear stress, shear strain, strain energy.

Compound Stress and Strains: State of stress at a point, Oblique stress, simple tension, pure shear, general two-dimensional stress system, principle planes, principle stresses and strains, Mohr's stress circle, Poisson's ratio, Maximum shear stress.

Bending Stress: Pure bending, Moment of inertia, Section modulus, Bending stresses, combined bending and direct stress, beam of uniform strength, middle third and Middle quarter rules for rectangular and circular sections.

Torsion: Circular shafts, Torsional shear stress, Strain energy in torsion, Shafts under varying torque, Compound shafts, Combined bending and twisting.

References:

Van Wylen G.J & Sonnlog R.E: Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY.

Wark Wenneth: Thermodynamics (2nd edition), McGraw Hill book Co. NY)
 Yadav R.: Thermodynamics and Heat Engines, Vol. I & II (SI Edition) Central Publishing House, Allahabad.
 Yadav R.: Steam and Gas Turbines.
 Kshitish Chandra Pal: Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta.
 S. Rao, B.B. Parulekar: 'Energy Technology', Khanna Pub, New Delhi.
 G.H. Ryder: "Strength of Materials".

List of Experiments:

1. Study of boiler models- Babcock Wilcox, Lancashire and Locomotive.
2. Study of Steam engine and steam turbine models.
3. Study of 2-stroke and 4-stroke I.C.E models.
4. Study of Fiat engine and/or Diesel engine prototype.
5. Study of vapour compression Refrigeration unit tutor/refrigerator.
6. Study of a window type air conditioner.
7. To conduct the tensile test on a UTM and determine ultimate Tensile strength, percentage elongation for a steel specimen.
8. To conduct the compression test and determine the ultimate compressive strength for a specimen

ADVANCE SURVEYING

Course Code CE 504

Credit-4[2-1-2]

Triangulation and Trilateration : Necessity of Control Surveying, Principle of Triangulation and Trilateration classification of Triangulation Systems Station Marks, Towers and Signals, Satellite station, Intersected and Resected points, Reconnaissance, Intervisibility of stations, Angular Measurement, Base line measurement and its extension

Adjustment Computations: Treatment of random errors, Normal law of errors, Most Probable Value, Weight of observations, Propagation of errors and variances, Principle of Least Squares, Observations and correlative Normal Equations, Adjustment of triangulation figures and level nets.

Curves: Classification of curves, Elements of Simple Circular, Transition and Vertical curves, Theory and methods of setting out circular, transition and vertical curves, special field problems.

Project Surveys: General requirements and specifications for Engineering project surveys, Reconnaissance, Preliminary and Location surveys for highways, railways and canals, Correlation of surface and underground surveys in case of culverts, Bridges and Tunnels; Principles and practice of hydrographic surveys, Layout of culverts, canals, bridges and buildings.

Field Astronomy: Astronomical terms, co-ordinate systems, Spherical trigonometry, Astronomical triangle, Relationship between coordinates.

Photogrammetry and Remote Sensing: Photogrammetry-Introduction, Scale of photograph, Tilt and height displacement, Stereoscopic vision and stereoscopes, Techniques of photo-interpretation, Principles of remote sensing, Electro Magnetic Radiation (EMR), energy interaction with atmosphere and earth features, spectral signatures, Remote sensing satellites and their data products, methods of interpretation of remotely sensed data.

GPS and GIS: Global Positioning System (GPS)-Introduction, principle, and applications of GPS in different fields of Surveying, Geographic Information System (GIS) – Introduction, Geographical concepts and terminology, Applications of GIS

References

Agor, R., "Surveying", Vol. II & III, Khanna Publications, Delhi, 1995.
 Arora, K.R., "Surveying", Vol. II & III, Standard Book House, Delhi.
 Bannister, A. And Baker, R., "Solving Problems in Surveying, "Longman Scientific Technical, U.K., 1994.
 Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd. London, 1990.
 Punmia, B.C., "Surveying", Vol.II & III Laxmi Publications, New Delhi.
 Duggal S.K., Surveying Vol. I & II TMH
 Basak, Surveying TMH.
 Kanetkar, Surveying
 Chandra, A.M. "Plane Surveying", New Age International Publisher, Delh
 Chandra, A.M. "Higher Surveying", New Age International Publisher, Delhi
 Lillesand, T.M. and Kiefer, R.W., "Remote Sensing and Image Interpretation".

BUILDING MATERIAL & CONSTRUCTION

Course Code CE-403

Credit-4[2-1-2]

Building Materials : Classification, Properties and selection criteria of Bricks Burning of Bricks , tests for bricks, stone Classification, characteristics of good building stone, common building stones in India, lime , IS

specifications, Field tests of Building limes, timber, Characteristics of good timber, defects in timber, seasoning of timber, tests on timber, plywood, glass, plastics, P.V.C. Mortar : Types, classification and strength, I.S. specifications.

Cement: Manufacture of cement, Different types of cement such as slag Cement, Portland Pozzolona Cement and high Alumina cement, their characteristics, composition, use and properties, Tests on Cements, Admixtures, Aggregates and Testing of Aggregates: Classification, source, physical and mechanical properties. Testing of Aggregates for physical and mechanical properties.

Building Construction: Classification of buildings, Recommendations of NBC, Building byelaws, modular co-ordination; orientation of buildings, desirable conditions of comforts, components of building area considerations. Types of foundations and selection criteria

Brick masonry, stone masonry. Types of walls, partition and cavity walls. Prefabricated construction. Plastering and pointing. Damp proofing materials and techniques, Antitermite treatment.

Types floors, construction details and selection criteria

Types of roofs and roof covering, treatment for water proofing.

Stair and staircases: Types, materials, proportions

Doors and windows: sizes and locations, proportions.

Lifts and escalators. White washing, colour washing, painting, distempering.

Shuttering, scaffolding and centering. Expansion and construction joints

Sound and fire proof construction, I.S. specifications

References :

Arora, S.P. & Bindra, S.P., 'A text book of Building Construction' Dhanpat Rai & Sons, Delhi, 1977.

Jha, J. & Sinha, S.K., "Building Construction", Khanna Publishers, Delhi, 1977.

Kulkarni, C.J., "A text book of Engineering Materials", Ahmedabad book Depot, Ahmedabad, 1968.

Kulkarni, C.J., "A text book of Engineering Construction", Ahmedabad Book Depot, Ahmedabad, 1968.

Kumar Sushil, "Engineering Materials", "Standard Publishers Distributors, Delhi, 1994.

Kumar Sushil, "Building construction", Standard Publishers, Distributors, Delhi, 1994

McKay W.B., "Building Construction, "Vol.1 to 4, Orient Longman Ltd., Hyderabad, Bombay, Madras, Delhi, Vol.1 & 2 -1995, Vol. 3-1996, Vol. 4-1998.

Punmia, B.C., "A text book of Building Construction", Laxmi Publications, Delhi, Madras, 1987.

Singh Surendra, "Engineering Materials," Konark Publishers Pvt. Ltd. 1994.

Civil Engg. Materials, TTTI Chandigarh, Tata McGraw- New Delhi.

Fundamental of Environmental Chemistry (CE-435)

Course introduction; Basic concepts from organic and equilibrium chemistry, Intro to atmospheric chemistry. Stratospheric ozone depletion, Ozone Holes, stratospheric ozone chemistry and intro to tropospheric Air Pollution, tropospheric air pollution. Consequences of air pollution and detailed atmospheric chemistry. Greenhouse Effect, Fossil Fuel energy and global warming, Dioxins, PCB's, Furans and other toxic organics, Chemistry of natural waters, Pollution and Purification of water.

COMPUTER BASED NUMERICAL STATISTICAL TECHNIQUES

Course Code MAS 491**Credit -5[3-1-2]**

Introduction: Errors in Numerical Computation, Mathematical Preliminaries, Errors and their Analysis, Machine Computations, Computer Software.

Algebraic & Transcendental Equation: Bisection Method, Iteration Method, Method of False Position, Rate of Convergence, Method for Complex Root, Muller's Method, Quotient Difference Method, Newton Raphson Method.

Interpolation: Introduction, Errors in Polynomial Interpolation, Finite Differences, Decision of Errors, Newton's Formulae for Interpolation, Gauss, Stirling, Bessel's, Everett's Formulae, Interpolation by Unevenly Spaced Points, Lagrange's Interpolation Formula, Divided Difference, Newton's General Interpolation Formula.

Curve Fitting, Cubic Spline & Approximation: Introduction, Method of Least Square Curve Fitting Procedures, Fitting a Straight Line, Curve Fitting by Sum of Exponentials, Data Fitting with Cubic Splines, Approximation of functions.

Numerical Integration & Differentiation: Introduction, Numerical differentiation, Numerical Integration, Trapezoidal Rule, Simpson 1/3 Rule, Simpson 3/8 Rule, Boole's and Weddle's Rule, Euler—Maclariaun Formula, Gaussian Formula, Numerical Evaluation of Singular Integrals.

Statistical Computation: Frequency Chart, Regression Analysis, Least Square Fit, Polynomial Fit, Linear & Non Linear Regression, Multiple Regressions, Statistical Quality Control Methods.

References:

Jain, Iyengar, Jain, "Numerical Methods for Scientific & Engineering Computation", New Age International.

Balaguruswamy, "Numerical Methods", TMH.

Sastry, "Introductory Method of Numerical Analysis", PHI.

Gerald & Wheatly, "Applied Numerical Analysis", Addison Wesley.

Probability & Statistic, Schaum Series.

Hulquit, "Numerical Method for Engineers & Computer Scientist", Addison Wesley.

Flowers, "Numerical Methods In C++", Oxford University Press.

Vedamurthy, "Numerical Methods", Vikas.

List of Experiments:

Write Programs in C

To deduce errors involved in polynomial Interpolation.

Algebraic and transcendental equations using Bisection, Iterative method of false position, also give rate of conversions of roots in tabular form for each of these methods.

To implement Bessel's functions, Newton's, Stirling, Languages.

To implement method of least square curve fitting.

Implement numerical differential using trapezoidal, Simpson 3/8 rules.

To show frequency chart, regression analysis, Linear Square fit and polynomial fit.

ENVIRONMENTAL STUDIES – II**Course Code SES-416****Credit -2[2-0-0]**

Natural Resources:

(a) Forest resources.

(b) Water resources.

(c) Mineral resources.

(d) Food resources.

(e) Energy resources.

(f) Land resources.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life style.

Biodiversity and its conservation:

(a) Introduction -Definition: genetic, species and ecosystem diversity.

(b) Bio geographical classification of India.

(c) Value of diversity: consumptive use, productive use, social, ethical aesthetic and option values.

(d) Biodiversity at global, National and local levels.

(e) India as mega-diversity nation

Environmental Physics

CE-439

Introduction to Energy: Importance of energy in science and society. Law of conservation of energy. Energy transformations. Heat and Temperature. Internal Energy, Specific Heat. Ideal gas equation. Kinetic theory interpretation of pressure and temperature. Work, heat, and the first law of thermodynamics. Adiabatic lapse rate. Radiant energy. Blackbody radiation. Energy balance of the Earth. Greenhouse effect. Climate feedbacks (water, clouds, ice albedo). Global Climate Models. Evidence for climate change. Paleoclimate. Climate change impacts. Climate change mitigation. Target CO₂ levels. Energy in biology, photosynthesis, respiration. Energy use in the human body, energy content of food. Fossil fuels and their origin (coal, oil, natural gas). Problems with fossil fuels, greenhouse pollution, peak oil. Alternatives to fossil fuels.

CE 441 Environmental Microbiology [3-0-1]

Unit I:

Introduction to microbiology: Concept and scope of microbiology, kinds of microorganisms, major characteristics and the role of microorganisms, microorganisms in nature.

Environmental Microbiology: Basic principles of microbial transformation of organic matter, biodegradation, acclimatization of wastes and microbial inhibition mechanisms. Structure and function of cell constituents.

Unit II:

Pure and mixed cultures, Aerobic and anaerobic metabolism, microbial growth and dynamics, Microbial taxonomy, classification and morphological aspects of bacteria, fungi, protozoa, algae and other higher aquatic life forms. Bioassay tests for toxicity evaluation, Pathogens and indicator organisms. Role of microorganisms in water and waste water engineering. Microbiology applied to air pollution control (Bio scrubbers and bio-filters).

Fundamental of Environmental Engineering

CE-440

Structure of environment, Interaction between biological and chemical components, law of mass action, chemical equilibria, catalysis and photocatalysis corrosion and its control.

Biological systems: plants and animals distribution, interaction, biomass, classification. Nutrients and microorganism, environmental factors. Biological indices, biomonitoring methods, eutrophication, bacterial reductions. Algae in water supply system- problems and control.

Chemistry of atmosphere: structure of atmosphere, ozone layer depletion, acid rain, green house gases and global warming

Engineering Geology

Course Code CE – 605

Earth Sciences and its importance in Civil Engg. Minerals and their physical properties. Study of common rock forming minerals. Internal structure of the earth. Suitability of rocks as engineering materials. Building stones occurrences and characteristics, selection Rocks origin, Characteristics, Texture, structure and classification of igneous, sedimentary and metamorphic rocks. Engineering properties of rocks. Strike and dip of strata, folds, faults, joints, unconformity and their classification, Causes and relation to engineering behaviour of rock masses. Overlap. Landslides causes, classification and preventive measures. Earthquake causes, classification, earthquake waves, intensity and magnitude, Seismic zones for India, Geological consideration for construction of building. Underground water, sources, Aquifer, Aquiclude, Artesian well, Ground water provinces of India and its role as geological hazard. Geological investigations for site selection of dams & reservoirs, tunnels, bridges and highways. Reservoir induced seismicity. Methods of Geophysical explorations-gravity, electrical and seismic, methods.

Water Resource Engineering – I

Course Code SWLE 408

Water Resources planning and management: Objectives, constraints and criteria based on technical, economical, social and political factors. Assessment of surface water resources of India, Intra and inter basin development concepts. Single and multipurpose projects.

Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.

Sediment Transportation: Suspended and Bed load and its estimation

Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programmes for design of channels

Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining.

Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion

River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

Public Health Engineering

CE-521

Introduction to public health, Environmental disease, Global burden of diseases, Toxicology, Epidemiology, Public health measures for disease control, Vector-borne disease, Vector-borne disease control methods, Pesticides and Herbicides uses and effects. Common source diseases – Food and Water, Health aspects of excreta disposal, On-site wastewater treatment, Water demand and supply, Public health hazards, Inorganic and Organic Hazards. water supply and reuse.

Health Safety and Environment

CE-522

Introduction : Types of hazards, analysis of hazards , precautions & preventions , grades of hazards, Safety methods, Safety measures . IS 18001:2000/ 9001:2000 ISO 14001:1996 Comparison, Importance of H.F& S, Industrial scope/Act/Compensation Fire hazards : Classification of fire , Grades of fire hazard . Classification of buildings / structures / materials. chemicals according to fire load . Fire hazard analysis , consequences & management. Mode of fire, fire fighting, Provision of buildings & Industrial structures from – fire safety angle.

Different types of fire alarms / detectors & extinguishers, fire fighting requirements as per NBC 1983 / Municipality water supply requirements for fire, required fire flow, storage. wet risers, sprinkler , fire fighting services etc.

General discussion on toxicology. Physiological effects of various compounds, Classification of hazardous chemicals/conditions. Occupational health & safety concepts. Classes of Explosive Protection & prevention measures of accidents & hazards Transportation & storage of chemicals, leakage & accident prevention .Industrial risk & Disaster management Survey of two industries for disaster / safety control systems, Electrical Safety Programme pollution control Practices in pesticides Industries.

Transportation Engineering

Course Code CE 523

Introduction : Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types and pattern.

Geometric Design : Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

Traffic Engineering : Traffic characteristic, volume studies, speed study, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

Design of Highway Pavement: Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2001), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC : 58 – 2002).

Road Construction Methods : WBM, Surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction

Airport Engineering : Air craft characteristics, types of airports, layout of airports, airport planning & design, runway orientation, wind-rose diagram, estimation of runway length & correction.

Air Pollution Control Engineering

CE 524

Introduction to the course. **Air pollution:** A Retrospective.

Air pollution: sources & types and effects on biosphere. National & International air emission standards; air pollution emission inventory; emission factor; air quality index; air pollution control laws.

Stake holder analysis – role of CPCB, MoEF, DoI, NGOs & major R&D institutes.

Introduction to air pollution meteorology

Gaussian plume dispersion model: theory and application.

Air pollutant monitoring and control: SO₂, NO₂, particulates, Hydrocarbons

Urban air pollution: sectoral analysis; trends in major cities of India and government initiatives Introduction to indoor air pollution

Global effects of air pollution: Green house effects, acid rain and ozone layer depletion; international agreements for mitigating global air pollution effects.

Solid Waste Engineering & Management

(CE 525)

Municipal Solid Waste Management. Generation and Characteristics of Waste. Health and Environmental Effects. Waste Collection, Storage and Transport. Record Keeping, Control, Inventory and Monitoring. Implementing Collection and Transfer System. Case Study-Waste Storage, Collection and Transport. Waste Disposal - Key issues and features. Sanitary Landfill. Waste Processing Techniques.

Volume, size and Chemical reduction techniques. Source Reduction, Product Recovery and Recycling. Planning of a Recycling Programme. Recycling Programme Elements.

Recovery of Biological Conversion Products: Composts and Biogas.

Composting and Biogasification: Technology. Environmental Effects of Composting and Biogasification. Incineration and Energy Recovery.

Hazardous Waste: Management and Treatment.

Integrated Waste Management (IWM).

Waste Water Engineering & Management

CE 526

Water and Wastewater Quantity Estimation Population forecast; Water demand for various purposes; Estimation of wastewater quantity; Variation in quantity of water and wastewater Wastewater Collection Systems, Domestic Wastewater Treatment, Wastewater characteristics; Primary, secondary and tertiary treatment; Physical Unit Processes Screening; Commutation; Grit Removal; Equilization; Sedimentation; Introduction to Microbiology

Microbial ecology and Growth kinetics; Types of microorganisms; aerobic vs. anaerobic processes, Biological Unit Processes: Aerobic treatment; Suspended growth aerobic treatment processes; Activated sludge process and its modifications; Attached growth aerobic processes; Trickling filters and Rotating biological contactors; Anaerobic treatment; suspended growth, attached growth, fluidized bed and sludge blanket systems; nitrification, denitrification; Phosphorus removal Natural Wastewater Treatment Systems Ponds and

Lagoons; Wetlands and Root-zone systems. Wastewater Treatment Plant Characteristics Sequencing of unit operations and processes; Plant layout; Hydraulic considerations.

Water Pollution

CE- 527

Water Quality, Resources, Supply, Shortage, Sustainability, Consuming, Global water Crisis. Chemical, Physical and Biological properties of Water. Water ecosystems. Integrated Water Resources Management. Sources for water Pollution. Water contaminants, Aquatic toxicology, Heavy minerals, Organic contaminants, PCBs and other Halogens materials, PAH, Pesticides, Waterborne Pathogens and Water Microbiology. Destiny of contaminants transmission and transformation. Dissolved Oxygen and natural Purification. Waterborne Diseases. Deposit - Water interaction. Acidification. Water resourcing Monitoring. Point source Protection. Water and sewage purification (treatment). Decontamination Methods. Water quality indicators. Water Legislations, Standards, Instructions.

Fossil Fuel Engineering

CE-528

History of Fuels, History of solid fuel, History of liquid fuels and gaseous fuels, Production, present scenario and consumption pattern of fuels, Fundamental definitions, properties and various measurements, Definitions and properties of solid fuels, Definitions and properties of liquid and gaseous fuels, Various measurement techniques, Coal classification, composition and basis, Coal mining, Coal preparation and washing, Combustion of coal and coke making, Action of heat on different coal samples, Different types of coal combustion techniques, Coal tar distillation, Coal liquefaction, Direct liquefaction, Indirect liquefaction, Coal gasification, Exploration of crude petroleum, Evaluation of crude, Distillation, Atmospheric distillation, Vacuum distillation, Secondary processing, Natural gas and LPG, Producer gas, Water gas, Hydrogen, Acetylene, Other fuel gases, Fundamentals of thermochemistry, Combustion air calculation, Calculation of calorific value of fuels, Adiabatic flame temperature calculation, Mechanism and kinetics of combustion, Flame properties, Combustion burners, Combustion furnaces, Internal combustion engines.

RIVER ENGINEERING

CE 529

Concepts of sustainability

Sustainability indicators, resources depletion, growth models, Planetary System Boundaries, footprints, prosperity, Globalization, inter-connected world, Stakeholders in sustainability Natural water resources Anthropocene, Climate change, climate variability, Hydrological

cycle, water balance, catchment terminology, River basin management, Water availability, surplus, deficit, Water scarcity, water crisis, Stream morphology and land use, Nutrient cycles

Status and challenges regarding sustainability and river basin management: Water and society, poverty, demography, Water governance, integrity, accountability, Pollution, water related diseases, source water protection, Water and land use, wetlands, desertification, Dams, diversions, artificial rainfall, Economic and financial instruments in water management, Hydrological change due to climate change, Towards sustainability in river basin management - a holistic and interdisciplinary approach, Protecting water resources / improving water quality Living standards, equity, education and technology transfer, Water conservation and efficiency, Improving monitoring and data management, decision support systems, Improving management and justice, Improving administrative (transnational) structures, Improving prediction and risk assessment,

How to evaluate sustainability in river basin management: Sustainability criteria (ecological, economic, institutional, social), Multi-criteria decision support.

Industrial waste water treatment

CE- 530

Introduction, Industrial scenario in India - Uses of water by industry - Sources and types of industrial wastewater – Industrial wastewater disposal and environmental impacts - Reasons for treatment of industrial wastewater, Regulatory requirements and pollution control boards- Industrial waste survey – Industrial wastewater generation rates, characterization and variables - Population equivalent - Toxicity of industrial effluents and Bioassay tests. Individual and Common Effluent Treatment Plants – Joint treatment of industrial wastewater. Cleaner production Waste management approach, source reduction, Waste audit- volume and strength reduction – Material and process modifications- Recycle, reuse and byproduct recovery, Zero discharge processes- case studies.

Environmental modelling and Simulation

CE-608

Outline the nature and scope of modelling within the environmental sciences, What is a model?, Types of Model, Physical models, Conceptual models, Mathematical Models, Overview of data analysis using Excel, Introduction to basic statistical tests and Probability theory, Simulation models, Mechanistic Models, Empirical Models, Deterministic & Stochastic Models, Validation, Model components, Equations, Input Data, Parameters Values

Implementation, Uncertainty in the model, Uncertainty in model outputs, Uncertainty due to Parameter errors, Input data and equation Errors, Monte Carlo simulation, Model Uncertainty and Sensitivity, Monte Carlo, Validation of models, Stochastic models, What is a probability distribution?, Accounting for variation in inputs, Model Fitting, Model Calibration, Comparing model predictions with data.

Costal zone Management

CE-609

Lagoons – Living resources – Non living resources. Wave classification – Airy's Linear Wave theory – Deep water waves – Shallow water waves – Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaking of waves – Wave force on structures – Vertical – Sloping and stepped barriers – Force on piles.

Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides – Darwin's equilibrium theory of tides – Effects on structures – seiches, Surges and Tsunamis.

Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal aquifers – Sea water intrusion – Impact of sewage disposal in seas.

Structures near coast – Selection of site – Types and selection of break waters – Need and mode of dredging – Selection of dredgers – Effect of Mangalore forest.

Noise Pollution

CE-610

Noise: Characteristics, Sources & Standards, Legal aspects, Legislation in India and in other countries. Physics of sound: Speed of sound, Sound pressure, Frequency, Wavelength, RMS Sound Pressure, Sound Pressure Level, Loudness, Sound Power Level and Sound Energy Density, Sound propagation, Wind and temperature gradient.

Types of noise: Neighborhood noise, Traffic noise, Occupational noise, Community noise.

Impact of noise: Health effects on wildlife & plants, Physiological Hazard & Psychological hazard, Occupational noise-exposure, Propagation of sound in open spaces.

Enclosures & Barriers: Lead as a noise barrier, Plenum barriers, Barrier around pipe, wires and rectangular duct work, barrier under two-way joist systems, High transmission loss ceilings, Acoustical foams, Nylon in noise reduction, damping compounds.

Vibration: Nature of vibration, Sources, Effects & measurements, Peak, average and RMS values, Principles of vibration transducers, vibration meters.

Noise reduction: Absorptive materials, Absorption coefficients, Transmission loss, Noise reduction, Noise isolation class (NIC), Vibration isolation and Active noise control.

Noise measuring equipments: Sound Level Meter, Octave Band Analyzer, Statistical Analyzer and Noise Average Meter.

Engineering control of noise: Basic control approaches, Regulatory control of noise, Simplified estimation procedures. Types of control, Isolation, Suppression, Shielding, Noise control on-blower-machines, Efficiency of silencers.

Environmental Project Management

CE-611

Ecosystem Concepts, Environmental Concerns in India, Policy and Legal Aspects of EM.

Introduction to Environmental Policies, Environmental Laws and Legislations, Environmental Legislations in India. Environmental Impact Assessment (EIA), Impact Prediction, Evaluation and Mitigation. Forecasting Environmental Changes. Strategic Environmental Assessment (SEA), Environmental Clearance Procedure in India, EIA Documentation and Processes, EIA Monitoring and Auditing. Environmental Auditing, Elements of Audit Process, Waste Audits and Pollution Prevention Assessments. EA in Industrial Projects. Liability Audits and Site Assessment. Auditing of EM. Life Cycle Assessment (LCA). Stages in LCA of a Product. Procedures for LCA. Different Applications of LCA. Environmental Management System Standards. EMS Standards: ISO 14000. Implementation of EMS Conforming to ISO 14001. Environmental management techniques. Application of Remote Sensing and GIS in EM. Ecosystem approach to risk assessment. Environmental Design. ED for Manufactured Products. ED for Buildings. ED for Developmental Planning. Environmental Economics. Economics and the Environment. Environmental Valuation. Economics of Natural Resources. Environmental and Regional Economics. Ecological Economics.

Industrial Process & Environment Pollution

CE 612

Industrial wastes and their sources: Various industrial processes, Sources and types of solid, liquid, gaseous wastes, Noise & radiation emissions. Sources of industrial water usages and various industrial processes requiring water use and required water quality.

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, biodegradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater reuse & recycling, Concept of zero discharge effluent.

Control of gaseous emissions: Hood and ducts, Tall stacks, Particulate and gaseous pollutant control, Solid waste generation and disposal management.

Hazardous wastes: Definitions, concepts and management aspects.

Noise & radiation: Generation, control and management.

Recent trends in industrial waste management, Cradle to grave concept, Life cycle analysis, Clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Environmental audit: Definition and concepts, Environmental audit versus accounts audit, Compliance audit, relevant methodologies, Various pollution regulations, Introduction to ISO and ISO 14000.

Water Resources Engineering II

SWLE 516

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient. Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis fall. Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars. Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works.

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir.

Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Pheratic line, and its determination Introduction to stability analysis.

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks.

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse.

Environmental Impact Assessment

CE 614

Environmental impact assessment (EIA): Introduction, definitions and concepts, rationale and historical development of EIA, EIA for civil engineers.

Broad components of EIA: Initial environmental examination, environmental impact statement, environmental appraisal, environmental impact factors and areas of consideration. Pertinent institutional information, unique pollution problems, existing visual quality, public participation techniques. Composite consideration, potential cultural resources, potential visual impacts, geographical study area.

Measurement of environmental impact, organization, scope and methodologies of EIA pertinent environmental factors.

Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system.

Public involvement techniques, comprehensive environmental impact study, various project types, archaeological properties, leachate testing, evaluation species, proposing agency, EIA Models. **Status of EIA in India:**

EIA Regulations in India, TOR for Hydropower Projects and other projects. Case studies from hydropower projects, hazardous industries and mining.

Environmental management: Principles, problems and strategies; Review of political, ecological and remedial actions. Future strategies; multidisciplinary environmental strategies, the human, planning, decision-making and management dimensions.

Environmental audit: Definitions and concepts, partial audit, compliance audit, methodologies and regulations.

EMS and Standardization: Introduction to ISO and ISO 14000. EMAS regulations, Wider application of system based approach. Local infrastructure development and environmental management: A system approach, Regional environmental management system, Conversion plan development and implementation strategies, Environmental management systems in local government.

Solid & Hazardous Waste

CE 615

Relevant Regulations

Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; flyash rules; recycled plastics usage rules; batteries (management and handling) rules.

Municipal Solid Waste Management – Fundamentals, Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options
Hazardous Waste Management – Fundamentals Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects, Radioactive Waste Management – Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options
Physicochemical Treatment of Solid and Hazardous Waste Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation

Biological Treatment of Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation.

Environmental Risk Management

CE-616

Linking Risk Analysis and Risk Management, Value-Focused Thinking, Structuring a Decision Problem, Making Choices Using Decision Analysis.

Introduction to Benefit-Cost Analysis, Risk Assessment and Risk Perception, Introduction to Technological Risk Assessment, Applications of Technological Risk Assessment, Health Risk Assessment, Introduction to Risk Perception, Precautionary Principle and Risk Perception. Stigma.

Risk Management: Valuation Procedures, Strategies for Dealing with Extreme Events, Risk Communication, Decision Making for Extreme Events in Organizations, Catastrophic Risks. Interdependent Security and Social Dilemmas, Dealing with Uncertainty.

Linking Risk Assessment, Risk Perception and Risk Management.

Advanced Waste water Treatment

CE 617

Introduction to Wastewater Engineering, Wastewater Laws and Regulations, Wastewater Flowrates

Wastewater Characteristics, , Flowrate Analysis, Flow Equalization, Pretreatment, Process Flow Diagram.

Principles of biological waste treatment, suspended growth and attached growth treatment process, system biology, oxygen transfer, Design of different aerobic treatment process. Rotating biological contactor. Biotowers, Low cost waste treatment methods.

Principles of anaerobic treatment processes, Design of anaerobic digesters, factors affecting efficiency of digesters.

Preliminary Treatment Plant Design, Design of Primary and Secondary Treatment Facilities, Advanced Wastewater Design, Sludge Treatment Design, Advanced Treatment and Sludge Processing

Environmental Policy and Legislation

CE-618

Environmental issues in India, Environmental policy, Objectives of environmental policy, Planning and Monitoring, Environment assessment, Environment indicators, sustainable development.

Air Quality & Climate Change, Environmental Legislation, Environmental Regulatory Processes. Environment Protection Act, 1986. National Conservation Strategy and Policy Statement on Environment and Development, 1992. Policy Statement for the Abatement of Pollution, 1992, National Environment Policy, 2006.

Legislations and Rules for the protection of environment in India: Water pollution, Air Pollution, Environment Protection, Wildlife, Forest Conservation, Biodiversity, National Green Tribunal, Animal Welfare.