Syllabus for B.Tech (CIVIL AND ENVIRONMENTAL ENGINEERING) Up to Fourth Year
Revised Syllabus of B.Tech CVE (for the students who were admitted in Academic Session 2010-2011)

CIVIL AND ENVIRONMENTAL ENGINEERING

SECOND YEAR - THIRD SEMESTER

Sl. No.	Code	Theory	Contact hours/wk				Credit point
THEORY							
			L	T	P	Total	
1.	HU301	Values and Ethics in Profession	3	0	0	3	3
2.	CH(CHE)302	Chemistry-2	3	1	0	4	4
3.	CH(FT) 301	Basic Environmental Engineering and Elementary Biology	3	0	0	3	3
4.	FT301	Thermodynamics & Kinetics	3	0	0	3	3
5.	CE302	Surveying	3	1	0	4	4
6.	CE303	Building Material & Construction	3	1	0	4	4
		Total of Theory				22	21
PRACTICAL							
7.	CH391	Environmental Engineering Lab	0	0	3	3	2
8.	CH392	Chemistry-2 Lab	0	0	3	3	2
9.	CE392	Surveying Practice-I	0	0	3	3	2
10.	CE393	Building Design &Drawing	0	0	3	3	2
		Total of Practical				12	08
		Total of Semester				34	29

SECOND YEAR - FOURTH SEMESTER

Sl. No.	Code	Theory	Contact hours/wk				Credit point
THEORY							
			L	T	P	Total	
1.	M(CS)401	Numerical Methods	2	1	0	3	2
2	CHE414	Unit Operation of chemical Engineering-I	3	0	0	0	3
3.	M402	Mathematics-3	3	1	0	4	4
4	CE402	Structural Analysis	3	1	0	4	4
5	CE403	Soil mechanics	3	1	0	4	4
		Total of Theory				19	17
PRACTICAL							
6.	HU481	Tech. Writing/Lang. Lab	0	0	3	3	2
7.	M(CS)491	Numerical Methods	0	0	2	2	1
8.	CE492	Surveying Practice - II	0	0	3	3	2
9.	CE493	Soil Mechanics Lab-I	0	0	3	3	2
10.	CHE484	Unit Operation Lab -I	0	0	3	3	2
		Total of Practical				14	9
		Total of Semester				33	26

<div align="center">THIRD YEAR - FIFTH SEMESTER</div>

THEORY

Sl. No.	Code	Theory	Contact hours/wk				Credit point
			L	T	P	Total	
1.	HU501	Economics for Engineers	3	0	0	3	3
2	CHE514	Unit Operation of Chemical Engineering-II	3	1	0	4	4
3.	CE502	Design of RC Structures	3	1	0	4	4
4	CE503	Concrete Technology	3	0	0	3	3
5	CE504	Engineering Geology	3	0	0	3	3
Total of Theory						17	17
PRACTICAL							
6.	CE591	Soil Mechanics Lab-II	0	0	3	3	2
7.	CE592	Concrete Lab	0	0	3	3	2
8.	CE593	Quantity Surveying , Specification and Valuation	0	0	3	3	2
9.	CE594	Engineering Geology Laboratory	0	0	3	3	2
Total of Practical						12	08
Total of Semester						29	25

<div align="center">THIRD YEAR - SIXTH SEMESTER</div>

THEORY

Sl. No.	Code	Theory	Contact hours/wk				Credit point
			L	T	P	Total	
1.	HU601	Principles of Management	2	0	0	2	2
2	FT604	Microbial Tech & Biotechnology	3	0	0	3	3
3.	CE602	Design of Steel Structure	3	0	0	3	3
4	CE603	Construction Planning& Management	3	0	0	3	3
5	CVE601	Professional Elective-I	3	0	0	3	3
6.	CVE602	Free Elective- I	3	0	0	3	3
Total of Theory						18	17
PRACTICAL							
7.	CVE 691	Environmental Chemistry Lab	0	0	3	3	2
8.	FT692	Microbial Tech Lab	0	0	4	4	2
9.	CE693	CAD Laboratory	0	0	3	3	2
10.	CVE681	Seminar	0	0	3	3	2
Total of Practical						13	08
Total of Semester						31	25

Professional Elective-I

    1. CVE601A: Solid & Hazardous Waste Treatment
    2. CVE601B: Industrial Waste Treatment

Free Elective –I

    1. CVE 602A : Operations Research (M)
    2. CVE 602B : Human Resource Management (HSS)
    3. CVE 602C : Materials Handling (ME)

FOURTH YEAR - SEVENTH SEMESTER

THEORY							
Sl. No.	Code	Theory	Contact hours/wk				Credit point
			L	T	P	Total	
1.	CE701	Environmental Engineering	3	0	0	3	3
2	CE702	Water Resource Engineering	3	0	0	3	3
3.	CVE701	Professional Elective-II	3	0	0	3	3
4	CVE702	Professional Elective-III	3	0	0	3	3
5.	CVE703	Free Elective- II	3	0	0	3	3
Total of Theory						15	15
PRACTICAL							
6.	HU781	Group Discussion	0	0	3	3	2
7.	CE791	Environmental Engineering Lab	0	0	3	3	2
8.	CVE791	Environmental Engineering Practice Sessional	0	0	3	3	2
9.	CVE792	Free Elective Laboratory	0	0	3	3	2
10.	CVE781	Industrial Training	4 weeks duration during 6th -7th Semester break				2
11.	CVE782	Project Part I				6	2
Total of Practical						18	12
Total of Semester						33	27

Professional Elective –II

    1. CVE701A: Soil Stabilization and Ground Improvement Techniques
    2. CVE701B: Advanced Highway and Transportation Engineering

Profession Elective –III

    1. CVE702A: Advanced Structural Analysis
    2. CVE702B: Hydraulic Structures

3. CVE702C: Climate & Ocean Currents

Free Elective –II

1. CVE703A : Engineering Materials (ME)
2. CVE703B : Electrical and Electronic Measurement (EE)

Free Elective Laboratory

1. CVE792A : Material Testing Lab (ME)
2. CVE792B : Electrical and Electronic Measurement Laboratory (EE)
3. CVE792C: Climate & Ocean Currents Lab

FOURTH YEAR – EIGHTH SEMESTER

THEORY							
Sl. No.	Code	Theory	Contact hours/wk				Credit point
			L	T	P	Total	
1.	HU801A HU801B	Organization Behavior/Project Management	2	0	0	2	2
2	CVE801	Professional Elective-IV	3	0	0	3	3
3.	CVE802	Professional Elective-V	3	0	0	3	3
	Total of Theory					8	8
PRACTICAL							
4.	CVE891	Environmental Engineering Design Practice	0	0	6	6	4
5.	CVE881	Project Part II	0	0	12	12	6
6.	CVE882	Grand Viva					3
	Total of Practical					18	13
	Total of Semester					26	21

Professional Elective –IV

1. CVE801A: Environment Pollution and Control (CE)
2. CVE801B: Water Resource Management and Planning (CE)
3. CVE801C: Remote Sensing and GIS (CE)

Professional Elective –V

1. CVE802A: Finite Element Method (CE)
2. CVE802B: Pavement Design (CE)

THEORY

VALUES & ETHICS IN PROFESSION
CODE: HU 301
CONTRACTS: 3L
CREDITS: 3

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society
Nature of values: Value Spectrum Of good life
Psychological values: Integrated personality; mental health
Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.
Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
Moral and Ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:
1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York
1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CHEMISTRY-2
CODE: CH (CHE) 302
CONTRACTS: 3L+1T
CREDITS: 4

Module I: 10L

Colloids: Introduction; Classification of colloids; Size and shape; preparation of sols; Origin of charge in Colloidal particles; Stability of Colloids; Kinetic, Optical & electrical properties; Electrokinetic phenomena; Electrical Double Layer; Ultracentrifuge and Molecular weight determination of Macromolecules. Viscosity: Definition of viscosity of a liquid; Determination of Viscosity; Shear Viscosity; Intrinsic Viscosity; Molecular weight from Viscosity measurement; Surface Tension: Introduction; Origin of Surface Tension; Surface energy; Laplace & Young-Laplace Equation, Capillarity; Contact Angle; Measurement of Surface Tension by Capillary rise method; Variation of Surface Tension of a liquid with Temperature and Concentration.

Module II: 10L

Kinetic theory of gases, Van der Waals Equation of state, Maxwell distribution law, vapour-liquid equilibrium, Colligative property. Adsorption: Introduction; Gibb's adsorption equation; Surface Excess; Adsorption isotherms: Freundlich, Langmuir, BET adsorption equations; Surface Films; Langmuir Balance; two-dimensional equation of state.

Module III: 10L

Introduction to quantum mechanics: Spectral shape pf Blackbody radiation, Planck's equation and a concept of quanta, breakdown of the classical equipartition principle, basic postulates of quantum mechanics, Hamiltonian function & Hamiltonian operator, important properties of a Hamiltonian operator, Heisenberg's uncertainty principle, Schrodinger equation and its solution for an electron in a one dimensional box where potential energy is zero inside & infinity outside the box. Normalization and orthogonality of the wavefunction. General Organic Chemistry: Common organic reactions i.e. Friedel-Crafts, Claisen Condensation, Cannizaro, Aldol condensation, Fischer-Tropsch;4 Preparation and synthetic application of Acetoacetic ester, Malonic ester and Grignard's reagent;

Module IV: 10L

Aminoacids: Classification; General methods of preparation and properties of amino acids, polypeptide synthesis, General properties of proteins, colour tests, enzymes. Lipids, fats and steroids; nucleic acid, DNA & RNA - generation and structure; cell nutrients- macronutrients,

micronutrients. Carbohydrate: Classification, Glucose and fructose, Disaccharides: Sucrose, maltose, cellobiose (introductory concept).

Revision: 5L

Text Books:

1. Physical Chemistry: G.W.Castellan, Narosa.
2. Organic Chemistry: Finar; I.L. – Vol – I & II, Pearson Education.
3. Organic Chemistry: Morrison & Boyd; PHI/Pearson Education.

References:

1. Physical Chemistry: P. W. Atkins: Oxford.
2. A Text book of Physical Chemistry: K. L. Kapoor: Macmillan
3. A guide Book to Mechanism in Organic Chemistry: Peter Sykes 4. Organic Chemistry: Loudon: Oxford

BASIC ENVIRONMENTAL ENGINEERING & ELEMENTARY BIOLOGY
CODE: CH 301
CONTACTS: 3L
CREDITS: 3

Introduction:

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.
1L
Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. 2L
Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L
Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. 2L

Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L
Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. 2L
Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.   2L

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.   1L
Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.   1L
Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget.   1L
Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).   2L
Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.   2L
Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN.   2L
Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozonemodification.   1L
Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).   1L

Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.   2L
River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH.   2L
Lake: Eutrophication [Definition, source and effect].   1L
Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only)   1L
Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.   2L
Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic.   1L

Land Pollution

Lithosphere; Internal structure of earth, rock and soil 1L Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.Solid waste management and control (hazardous and biomedical waste).   2L

Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]   1L
Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18hr Index) , Ld_n . Noise pollution control.   1L

Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.   2L

References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd.,1991.
2. De, A. K., "Environmental Chemistry", New Age International.

THERMODYNAMICS AND KINETICS
CODE: FT 301
CONTACTS: 3L
CREDITS: 3

Module I: 10L

Basic Concepts of Thermodynamics: The Ideal Gas, Review of first and second laws of thermodynamics, PVT behaviour of Pure Substances, Virial Equation of State, , Application of the Virial Equations, Cubic Equations of State, Generalized Correlations for Gases and Liquids. The Nature of Equilibrium, the Phase Rule, Duhem's Theorem

Module II: 10L

Simple model's for vapour/liquid Equilibrium, Roult's Law, Henry's law, Modified Raoult's Law, Vapour Liquid Equilibrium, K-value correlations; VLE from Cubic Equations of State; Equilibrium and Stability; Liquid/liquid equilibrium; Solid/liquid equilibrium, Solid/vapour equilibrium.

Module III: 10L

Thermodynamics and its Applications: The Chemical Potential and Phase Equilibria Fugacity and Fugacity, Coefficient: for pure species and solution; Generalised correlations for Fugacity, the Ideal Solution, Property Changes and Heat Effects of Mixing Processes. The Vapour-Compression Cycle, the Choice of Refrigerant, Absorption, Refrigeration and liquefaction: Low temperature cycle: Linde and Claude.

Module IV: 10L

Kinetics: Rate of chemical reaction; Effect of Temperature on Rate Constant, Arrehnius equation, Collision Theory, Transition State Theory, Order and Molecularity of a Chemical reaction,Elementary Reactions, First, Second and Third order reactions, Non Elementary Reactions, Pseudo-first order reaction, Determination of rate constant and order of reaction, Half life method, Fractional order reactions.

Revision: 5L

Textbook:

1. Smith & Vanness, Thermodynamics for Chemical Engineers, MGH

Reference books:

1. Richardson, J.F., Peacock, D.G.Coulson & Richardson's Chemical Engineering- Volume 3 ed., First Indian ed. Asian Books Pvt. Ltd. 1998
2. Levenspiel.O., Chemical Reaction Engineering, Wiley Eastern Ltd.
3. Bailey & Olis,Biochemical Engg. Fudamentals, MGH, 1990
4. Physical Chemistry: Castellan, Narosa Publishing.

SURVEYING
CODE: CE302
CONTACT: 3L + 1T
CREDITS: 4

Module I: 12L
Introduction:

Definition, classification of surveying, objectives, principles of surveying

Chain surveying:

Chain and its types, Optical square, Cross staff, Reconnaissance and site Location, locating ground features by offsets – Field book. Chaining for obtaining the outline of structures, Methods for overcoming obstacles, Conventional symbols, Plotting chain survey and Computation of areas, Errors in chain surveying and their elimination: Problems

Compass Surveying:

Details of prismatic compass, Use and adjustments, Bearings, Local attraction and its adjustments. Chain and compass surveying of an area, Booking and plotting, Adjustments of traverse, Errors in compass surveying and precautions: Problems.

Module II: 11L

Plane Table Surveying:

Equipment, Orientation, Methods of Plane Tabling, Three Point Problems.

Leveling:

Introduction, Basic definitions, Detail of dumpy Level, Temporary adjustment of Levels, Sensitiveness of bubble tube; Methods of leveling – Differential, Profile & fly Leveling, Effect of curvature and refraction, Automatic levels, Plotting longitudinal sections and Cross sections; Measurement of area and volume.

Contouring:

Topographic Map, Characteristics of Contour, Contour Interval. Methods of Locating Contours, Interpolation of Contours.

Module III: 11L

Theodolite Surveying:

Components of a Transit Theodolite, Measurement of horizontal and vertical Angles, Co-ordinates and traverse Table

Tacheometry: Definition, Details of stadia System, Determination of horizontal and vertical distance with Tacheometer- Staff held vertically and normal to the line of sight.

Module IV: 8L

Simple & Transition Curves:

Definition, Degree of Curve, Elements of Simple Curve, Setting out by Linear method and Rankine's tangential method, Transition Curves.

Introduction to Total Station with Field applications.

References

1 Surveying:- Vol - I & II B.C. Punmia
2 Surveying & Leveling R. Subramanian (OXFORD)
3 Surveying& Leveling Vol - I [Part I & II] T.P.Kanetkar & Kulkarni
4 Surveying:- Vol - I & II S.K. Duggal
5 Fundamental of Engineering Survey J.K. Ghosh (Studium Press, Roorkee)
6 Higher Surveying Dr. A. M. Chandra
7 Surveying R.B. Gupta & B.K. Gupta
9 Plane and Geodetic Surveying (Vol - I & II) David Clark
10 Fundamental of Surveying S. K. Roy
11 Surveying Saikia & Das (PHI)

BUILDING MATERIAL AND CONSTRUCTION
CODE: CE 303
CONTACT: 3L + 1 T
CREDITS: 4

Mod **Details of Course Content** Hours Total
Material of Construction

Module I: 13L

Bricks: Classification, Characteristics of good bricks, Ingredients of good brick earth, Harmful substance in brick Earth, Different forms of bricks, Testing of bricks as per BIS. Defects of bricks. Aggregates: Classification, Characteristics, Deleterious substances, Soundness, Alkali – aggregates reaction, Fine aggregates, Coarse aggregates, Testing of aggregates
Lime: Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling
Cement & Concrete:
Cement: OPC: Composition, PPC, Slag cement, Hydration, setting time
Concrete: Types, ingredients, W/C ratio, Workability, Different grades in cement concrete, Tests on cement concrete

Module II: 10L

Mortars: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars
Wood and Wood Products: Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Preservation of

Timber Testing of Timber, Veneers , Plywood, Fibre Boards, Particle Boards, Chip Boards , Black Boards, Button Board and Laminated Boards, Applications of wood and wood products

Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish , French Polish, Wax Polish

Miscellaneous Materials: Gypsum: Classification, Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards, Adhesives, Heat and sound insulating materials, Geo-synthetics

Module III: 10L

Foundations: Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations.

Brick masonry: Definitions, Rules for bonding, Type of bonds – stretcher bond, Header bond, English bond, Flemish Bond, Comparison of English Bond and Flemish Bond (one and one and half brick thick wall)

Wall, Doors and Windows: Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal

Module IV: 9L

Stairs: Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case

Flooring: Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing

Plastering and Pointing: Plastering with cement mortar, Defects in plastering, pointing, white washing, colour washing, Distempering,

Roofs: Types, Pitched roofs and their sketches, Lean – to roof, King Post – Truss, Queen post truss and Simple steel Truss , Roof Covering materials: AC sheets GI sheet

References

1 Building Materials S.K. Duggal
2 Building Materials P.C. Varghese PHI
3 Engineering Materials S.C. Rangwala
4 Concrete Technology M. S. Shetty
5 Concrete Technology A.M. Nevile & J.J. Brooks Pearson Education
6 Building Construction B.C. Punmia
7 Building Construction and Foundation Engineering Jha and Sinha

Practical

CHEMISTRY-2 LAB
CODE: CH (FT) 392
CONTACTS: 3P
CREDITS: 2

1. Amino Acid Analysis: pH measurements and Buffer Preparation
2. Amino Acid Analysis: Isoelectric Point Determination
3. Estimation of proteins by Lowry's method / Biuret method
4. Estimation of proteins by Bradford Assay
5. Determination of N, P, K, organic C from soil samples
6. Lipid/sugar: TLC/Paper Chromatography
7. Study on kinetics of iodine / ester hydrolysis
8. Detection of aldehyde / aliphatic or aromatic alcohol / carboxylic / ester / amino group(s)

ENVIRONMENTAL ENGINEERING LAB
CODE: CH 391
CONTACTS: 3P
CREDITS: 2

1. Physical examination of Sewage/Water:
a. Total Solid
b. Total dissolve solid
c. Total suspended solid
d. pH, color and odor

2. Chemical estimation of Sewage/Water and soil
a. Determination of Chlorides
b. Estimation of Chemical oxygen Demand

3. Microbial examination of Sewage/Water
a. Confirmation of coliforms
b. Biological oxygen demand

4. Determination of soil microbial biomass carbon.

5. Examination of different bacteria, algae, fungi, plants and animals by microscopic or morphological examination

SURVEYING PRACTICE- I
CODE: CE392
CONTACT: 3P
CREDITS :2

Chain surveying
Preparing index plans, Location sketches, Ranging, Preparation of map, Heights of objects using chain and ranging rods, Getting outline of the structures by enclosing them in triangles/quadrilaterals, Distance between inaccessible points, Obstacles in chain survey.

Compass surveying
Measurement of bearings, Preparation of map, Distance between two inaccessible points by chain and compass, Chain and compass traverse

Plane Table survey
Temporary adjustments of plane table and Radiation method, Intersection, Traversing and Resection methods of plane tabling, Three-point problem

Leveling
Temporary adjustment of Dumpy level, Differential leveling, Profile leveling and plotting the profile, Longitudinal and cross sectioning, Gradient of line and setting out grades, Sensitiveness of Bubble tube

Contouring
Direct contouring, Indirect contouring – Block leveling, Indirect contouring – Radial contouring, Demonstration of minor instruments

BUILDING DESIGN AND DRAWING
CODE: CE 393
CONTACT: 3P
CREDITS: 2

Foundations
Spread foundation for walls and columns; Footing for a RCC column, raft and pile foundations;

Doors and Windows
Glazed and paneled doors of standard sizes; Glazed and paneled windows of standard sizes; special windows and ventilators

Stairs
Proportioning and design of a dog-legged, open well RCC stair case for an office / Residential building; Details of reinforcements for RCC stair cases; Plan and elevation of straight run, quarter turn, dog-legged and open well stair cases.

Roofs and Trusses

Types of sloping roof, lean-to roofs, RCC roof with details of reinforcements, King post and Queen post trusses.

Functional Design of Buildings
To draw the line diagram, plan, elevation and section of the following:

Residential Buildings (flat, pitched and combined roofs), Office Buildings (flat roof), School
The designs must show positions of various components including lift well and their sizes.

Introduction to drawing by using software package

References

1 Principles of Building Drawing, Shah & Kale
2 Text Book of Building Construction, Sharma & Kaul
3 Building Construction , B C Punmia

SEMESTER IV
THEORY

NUMERICAL METHODS
CODE: M (CS) 401
CONTACTS: 2L+1T
CREDITS: 2

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (4L)

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. (5L)

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3L)
Numerical solution of a system of linear equations:
Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.Numerical solution of Algebraic equation (6L)

Bisection method, Regula-Falsi method, Newton-Raphson method. (4L)

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (6L)

Text Books:

1. C.Xavier: C Language and Numerical Methods.

2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

References:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.

UNIT OPERATIONS OF CHEMICAL ENGINEERING – I
CHE 414
CONTACTS: 3L
CREDITS: 3

Module I (10L):

Basic Concepts of Fluid Mechanics : Dimensional Analysis: Buckingham Pi-theorem, Dimensionless groups, Conversion of equations. Basic equations of Fluid Flow, Hagen Poiseille equation, Bernoulli Equation, Fluid Friction. Friction in flow through packed beds, fundamentals of fluidization.

Module II (10L):

Flow measurements and machineries : Flow through pipes and open channels, Orifice and Venturimeters, Pitot Tube, Weirs, Rotameters and other types of meters, Transportation of fluids, Pipe Fittings and valves, Pumps – classification, centrifugal and positive displacement type – peristaltic. Blowers and compressors (oil-free).

Module III (10L):

Heat transfer: Classification of heat flow processes, conduction, Thermal conductivity. Heat flow in fluids by conduction and convection. Countercurrent and parallel flow. Enthalpy balance in heat exchange equipment. Individual heat transfer coefficients, overall coefficient, Heating and cooling of fluids, Heat transfer equipment. Unsteady state heat transfer, Radiation.

Module IV (10L):

Mechanical Operations: Principles of comminution, Types of comminuting equipment. Energy and power requirement, Crushers, Grinders, Mixing and Agitations, Power consumption in mixing, Mechanical separation, Screening, Types of screen, Filtration, Principle of Constant pressure and constant rate filtration, Settling classifiers, Floatation, Centrifugal separations.

Revision: 5L

Books :

1. Unit Operations of Chemical Engineering: McCabe, Smith & Harriot, TMH, 5th edition
2. Transport Processes & Unit operations: Geankopolis, PHI, 3rd edition
3. Chemical Engineering, Vol-I & II: Coulson & Richardson, Butterworth Heinemann
4. Heat Transfer: D.Q. Kern, MGH
5. Badger, W.L., Banchero, J.T., Introduction to Chemical Engineering, MGH
6. Foust, A.S., Wenzel, L.A., et.al. Principles of Unit Operations, 2nd edition, JWS
7. Perry, Chilton & Green, Chemical Engineers' Handbook, MGH
8. Unit operations and unit processes for Engineers and Biologists; B. C. Bhattacharya and C. M. Narayanan; Khanna Publications, Delhi
9. Mechanical Operations for Chemical Engineers; C. M. Narayanan and B. C. Bhattacharya; Khanna Publishers, Delhi

MATHEMATICS 3
CODE: M 402
CONTACTS: 3L +1T
CREDITS: 4

Note 1: The entire syllabus has been divided into four modules.
Note 2: Structure of Question Paper
There will be two groups in the paper:
Group A: Ten questions, each of 2 marks, are to be answered out of a total of 15 questions, covering the entire syllabus.
Group B: Five questions, each carrying 10 marks, are to be answered out of (at least) 8 questions.

Students should answer at least one question from each module.

[At least 2 questions should be set from each of Modules II & IV. At least 1 question should be set from each of Modules I & III. Sufficient questions should be set covering the whole syllabus for alternatives.]

Module I: Fourier Series & Fourier Transform [8L]

Topic: Fourier Series:

Sub-Topics: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave. (1)

Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period 2l, Dirichlet's conditions, Sum of Fourier series. Examples. (1)

Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only). Examples. (2)

Topic: Fourier Transform:

Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions.   (1)

Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples. Fourier Transform of Derivatives. Examples.   (1)
Convolution Theorem (statement only), Inverse of Fourier Transform, Examples.   (2)

Module II : Calculus of Complex Variable [13L]

Topic: Introduction to Functions of a Complex Variable.

Sub-Topics:
Complex functions, Concept of Limit, Continuity and Differentiability.   (1)

Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. (1)
Construction of Analytic functions: Milne Thomson method, related problems**.**   (1)

Topic: Complex Integration.
Sub-Topics: Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples. (2)

Cauchy's theorem (statement only). Cauchy-Goursat theorem (statement only). Examples. (1)

Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function. Examples. (2)
Taylor's series, Laurent's series. Examples   (1)

Topic: Zeros and Singularities of an Analytic Function & Residue Theorem.
Sub-Topics: Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature.   (1)
Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of definite integrals: $\int_{0}^{\infty}\frac{\sin x}{x}dx$, $\int_{0}^{2\Pi}\frac{\theta}{a+b\cos\theta+c\sin\theta}dx$, $\oint_{c}\frac{P(z)}{P(z)}dz$

(elementary cases, P(z) & Q(z) are polynomials of 2nd order or less).

Topic: Introduction to Conformal Mapping.

Sub-Topics:
Concept of transformation from z-plane to w-plane. Concept of Conformal Mapping. Idea of some standard transformations. Bilinear Transformation and determination of its fixed point.

(1)

Module III: Probability [8L]

Topic: Basic Probability Theory

Sub-Topics:
Classical definition and its limitations. Axiomatic definition.

Some elementary deduction: i) $P(O)=0$, ii) $0 \leq P(A) \leq 1$, iii) $P(A')=1-P(A)$ etc. where the symbols have their usual meanings. Frequency interpretation of probability. (1)
Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems. Conditional probability & Independent events. Extension to more than 2 events (pairwise & mutual independence). Multiplication Rule. Examples. Baye's theorem (statement only) and related problems. (3)

Topic: Random Variable & Probability Distributions. Expectation.

Sub-Topics:
Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof). Examples. Definitions of Expectation & Variance, properties & examples. (2)
Some important discrete distributions: Binomial & Poisson distributions and related problems. Some important continuous distributions: Uniform, Exponential, Normal distributions and related problems. Determination of Mean & Variance for Binomial, Poisson & Uniform distributions only. (2)

Module IV: Partial Differential Equation (PDE) and Series solution of Ordinary Differential Equation (ODE) [13L]

Topic: Basic concepts of PDE.

Sub-Topics:
Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transform methods. (1)

Topic: Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace & Fourier transform methods.

Sub-Topics:

PDE I: One dimensional Wave equation.   (2)
PDE II: One dimensional Heat equation.   (2)
PDE III: Two dimensional Laplace equation.   (2)

Topic: Introduction to series solution of ODE.

Sub-Topics:
 Validity of the series solution of an ordinary differential equation. General method to solve Po
$y''+P1\ y'+P2\ y=0$ and related problems.   (2)

Topic: Bessel's equation.

Sub-Topics:
Series solution, Bessel function, recurrence relations of Bessel's Function of first kind.   (2)

Topic: Legendre's equation.

Sub-Topics:
Series solution, Legendre function, recurrence relations and orthogonality relation.   (2)

Text Books:

1. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
2. Das N.G.: Statistical Methods, TMH.
3. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
4. James G.: Advanced Modern Engineering Mathematics, Pearson Education.
5. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.

References:

1. Bhamra K. S.: Partial Differential Equations: An introductory treatment with applications, PHI
2. Dutta Debashis: Textbook of Engineering Mathematics, New Age International Publishers.
3. Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
4. Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
5. Ramana B.V.: Higher Engineering Mathematics, TMH.
6. Spiegel M.R. , Lipschutz S., John J.S., and Spellman D., : Complex Variables, TMH.

STRUCTURAL ANALYSIS
CODE: CE402
CONTACT: 3L + 1 T
CREDITS: 4

Review of basic concept of mechanics: Equilibrium, Free body diagram, Determinate and
Indeterminate structures, Degree of indeterminacy for different types of structures: Beams,
Frames, Trusses   4L

Analysis of determinate structures: Portal frames, arches, cables   4L

Strain energy: Due to axial load, bending and shear, Torsion; Castigliano's theorems, theorem of minimum potential energy, principle of virtual work, Maxwell's theorem of reciprocal deflection, Betti's law   4L

Deflection determinate structures: Moment area and Conjugate beam method, Energy methods, Unit load method for beams, Deflection of trusses and simple portal frames.   8L

Influence line diagrams: Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears.   6L

Analysis of statically Indeterminate beams: Theorem of three moments, Energy methods, Force method (method of consistent deformations) [for analysis of propped cantilever, fixed beams and continuous beams (maximum two degree of indeterminacy) for simple loading cases], Analysis of two-hinged arch.   8L

Analysis of statically indeterminate structures:
Moment distribution method - solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway. Slope Deflection Method – Method and application in continuous beams and Frames. Approximate method of analysis of structures: Portal & Cantilever methods   8L

References
1 Engineering Mechanics of Solids By E. P. Popov Pearson Education
2 Basic structural Analysis C.S. Reddy TMH
3 Statically indeterminate structures C. K. Wang McGraw-Hill
4 Elastic analysis of structures Kennedy and Madugula Harper and Row
5 Structural Analysis (Vol I & Vol II) S S Bhavikatti Vikas Publishing House Pvt. Ltd
6 Structural Analysis Ramammurtham
7 Structures Schodek & M. Bechhold Pearson Education

SOIL MECHANICS
CODE: CE403
CONTACT: 3L+1T
CREDITS: 4

Introduction: Origin & formation of Soil: Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy   2

Physical & Index properties of soil: Weight- Volume Relationships, Insitu Density, Moisture Content, Specific Gravity, Relative Density, Atterberg's Limits, Soil Indices, consistency of soil ,Particle Size Distribution of soil: Sieving, Sedimentation Analysis   6

Identification & Classification of soil: Field identification of soil, Soil Classification: as per Unified Classification System, IS Code Recommendation, AASHTO Classification   4

Flow through soil: Darcy's Law, Coefficient of permeability, laboratory and field determination of coefficient of permeability, Permeability for Stratified Deposits, Laplace's Equations, Flow nets, Flow Through Earthen Dam, Estimation of Seepage, Uplift due to seepage   6

Effective Stress Principles: Effective Stress, Effective pressure due to different conditions, Seepage force, Critical hydraulic gradient, Quick sand condition, Design of filters, Capillarity in soil   4

Stress Distribution In Soil: Normal and shear stresses, Stress due to point loads, Stress beneath Line, strip & uniformly loaded circular area & rectangular area, pressure bulbs, Newmark's charts- Use for determination of stress due to arbitrarily loaded areas   4

Compaction of soil: Principles of Compaction, IS Light & Heavy Compaction Test, Field Compaction, Various methods of field compaction and control   4

Compressibility & Consolidation of Soil: Terzaghi's theory of one dimensional consolidation, Compressibility characteristics of soils: Compression index, Coefficient of compressibility & volume change, Coefficient of consolidation, Degree & rate of consolidation, Laboratory method of one dimensional consolidation test, Determination of consolidation parameters, Secondary consolidation   6

Shear Strength of Soil: Basic concepts, Mohr- Columb's Theory, Laboratory Determination of soil shear parameter- Direct Shear, Tri-axial Test, Unconfined Compression, Vane Shear Test, Sensitivity & thixotropy of clay.   6

References

1 Principles of Geotechnical Engineering B. M. Das Thomson Book Store
2 Text book of Soil Mechanics & Foundation Engineering V.N.S. Murthy CBS Publisher's & Distributors
3 Geotechnical Engineering – Principles and Practice Coduto Pearson Education
4 Soil Mechanics Lambe & Whitman. WIE
5 Basic & Applied Soil Mechanics Gopal Ranjan & A.S.R.Rao Willes EasternLtd
6 SP 36 (Part I) Numerical Problems – Geotechnical Engineering Rao & Venkatramaiah University Press

PRACTICAL

TECHNICAL REPORT WRITING & LANGUAGE LAB PRACTICE
CODE: HU481
CONTACTS: 3P
CREDITS:2

Guidelines for Course Execution:
Objectives of this Course: This course has been designed:

1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.
Detailed Course Outlines:

A. *Technical Report Writing*: 2L+6P
1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

B. Language Laboratory Practice
1. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory
Practice Sessions   2L

2. Conversation Practice Sessions: (To be done as real life interactions)
                                                                                                                            2L+4P
a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed
b) Introducing Role Play & honing over all Communicative Competence

3. Group Discussion Sessions: 2L+6P
a) Teaching Strategies of Group Discussion
b) Introducing Different Models & Topics of Group Discussion
c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure

Interview Sessions: 2L+6P
a) Training students to face Job Interviews confidently and successfully
b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication

4. Presentation: 2L+6P
a) Teaching Presentation as a skill
b) Strategies and Standard Practices of Individual /Group Presentation
c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids

5. Competitive Examination: 2L+2P
a) Making the students aware of Provincial /National/International Competitive Examinations
b) Strategies/Tactics for success in Competitive Examinations
c) SWOT Analysis and its Application in fixing Target

Books – Recommended:

Nira Konar: English Language Laboratory: A Comprehensive Manual PHI Learning, 2011
D. Sudharani: Advanced Manual for Communication Laboratories &

Technical Report Writing
Pearson Education (W.B. edition), 2011

References:

Adrian Duff et. al. (ed.): Cambridge Skills for Fluency
A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)
B) Listening (Levels 1-4 Audio Cassettes/Handbooks) Cambridge University Press 1998

Mark Hancock: English Pronunciation in Use 4 Audio Cassettes/CD'S OUP 2004

NUMERICAL METHODS LAB
CODE: M (CS) 491
CONTACT: 2P
CREDIT: 1

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

SURVEYING PRACTICE II
CODE: CE492
CONTACT: 3P
CREDITS: 2

1. Traversing by Using Theodolite: Preparation of Gales Table from field data
2. Traversing by using Total Station
3. Use of Total Station for leveling and Contouring
4. Setting out of Simple Curves

SOIL MECHANICS LAB – I
CODE: CE493
CONTACT: 3P
CREDITS: 2

1. Field identification of different types of soil as per Indian standards [collection of field samples and identifications without laboratory testing], determination of natural moisture content.
2. Determination of specific gravity of i) Cohesionless ii) cohesive soil
3. Determination of Insitu density by core cutter method & sand replacement method.
4. Grain size distribution of cohessionless soil by sieving & finegrained soil by hydrometer analysis.
5. Determination of Atterberg's limits (liquid limit, plastic limit & shrinkage limit).
6. Determination of co- efficient of permeability by constant head pemeameter (coarse grained soil) & variable head parameter (fine grained soil).
7. Determination of compaction characteristics of soil.

References:

1. Soil Testing by T.W. Lamb (John willey)
2. 2. SP-36 (Part I- & Part – II)
3. Soil Mechanics Laboratory Manual by Braja Mohan Das, OXFORD UNIVERSITY PRESS
4. Measurement of Engineering properties of soil by E Saibaba Reddy & K. Rama Sastri. (New age International publication.

UNIT OPERATION LAB – I
CODE: CHE 484
CONTACT: 3P
CREDITS: 2

1. Experiments on Reynolds's Apparatus –Determination of flow regime and construction of friction factor against NRE.
2. Experiments on flow measuring device — in closed conduit using (a) Venturimeter, (b) Orifice meter, (c) Rotameter.
3. Determination of Pressure drop for flow through packed bed & verification of Ergun Equation, Kozeny-Karman equation, Blake-Plummer Equation.
4. To study the working characteristics of a Jaw Crusher, calculate the energy consumption as a function of size reduction and compare it with the actual energy requirements.
5. To study the working characteristics of a Ball Mill, calculate the energy consumption as a function of size reduction and determine the critical speed.
6. To Determine the Overall heat transfer coefficient of a concentric pipe heat exchanger based on the inside diameter of the tube.
7. To study the characteristics of film-wise/drop-wise condensation.

ECONOMICS FOR ENGINEERS
CODE: HU 501
CONTRACTS: 3L
CREDITS: 3

Module-I

1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.

Module-II

3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.
4. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

Module-III

5. Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

Module-IV

8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.
9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.
10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

Readings

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

UNIT OPERATIONS OF CHEMICAL ENGINEERING – II
CODE: CHE514
CONTRACTS: 3L + 1T
CREDITS: 4

Module I: 10L

Introduction to mass transfer: Molecular diffusion in fluids, diffusivity, mass transfer coefficients, interphase mass transfer, gas absorption, countercurrent multistage operation, packed tower.

Module II: 10L

Distillation: Vapor-liquid equilibrium, Rayleigh's equation, flash and differential distillation, continuous rectification, McCabe-Thiele method, bubble cap and sieve distillation column.

Module III: 10L

Extraction, Drying and Crystallization: Liquid-liquid equilibrium, liquid extraction, stage-wise contact, liquid-solid equilibria, leaching, batch drying and mechanism of batch drying, principle and operation of a spray drier, preliminary idea of crystallization.

Module IV: 10L

Advanced separation processes: Dialysis, ultrafiltration, reverse osmosis, pervaporation, electro dialysis and membrane separation.

Revision: 5L

Books:

1. Unit Operations of Chemical Engineering; McCabe, Smith & Harriot; 6th ed, TMH.
2. Transport Processes & Unit operations; Geankopolis; 3rd ed, PHI.
3. Chemical Engineering, Vol-I & II, Colson & Richardson; Butterworth Heinemann.
4. Chemical Engineer's Handbook; Perry, Chilton & Green; MGH.

The hours allotted are lecture hours, the tutorial classes should be held accordingly to contact hours allotted subject wise

DESIGN OF RC STRUCTURES
CODE: CE502
CONTACT: 3L + 1T
CREDITS: 4

Introduction: Principles of design of reinforced concrete members - Working stress and Limit State method of design   2L

Working stress method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces - Balanced, under reinforced and overreinforced beam/ slab sections; design of singly and doubly reinforced sections   5L

Limit state method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces; concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP:16).   5L

Analysis, design and detailing of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method.   5L

Design and detailing of one-way and two-way slab panels as per IS code provisions   6L

Design and detailing of continuous beams and slabs as per IS code provisions   3L

Staircases: Types; Design and detailing of reinforced concrete doglegged staircase   3L

Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP 16.   3L

Shallow foundations: Types; Design and detailing of reinforced concrete isolated Square and Rectangular footing for columns as per IS code provisions by limit state method   4L

• **Limit state method should be followed for serial number 4 to 9 as above as per IS 456 - 2000**

Text & References

1 IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice" Bureau of Indian Standard
2 SP:16 Design Aid to IS 456
3 Reinforced Concrete Design by Pillai and Menon TMH
4 Reinforced concrete Limit state design Ashok K. Jain
5 Reinforced concrete S.N.Sinha TMH
6 Fundamentals of reinforced concrete N.C.Sinha and S.K. Roy S.Chand &Co
7. Limit State Design of Reinforced Concrete P. C. Varghese PHI
8. Reinforced Concrete S. K. Mallick and A. P.GuptaOxford IBH

CONCRETE TECHNOLOGY
CODE: CE503
CONTACT: 3L
CREDITS: 3

Concrete as a Structural Material, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, Tests on Cement and Cement Paste – fineness, consistency, setting time, soundness, strength Quality of Water – Mixing Water, Curing Water, Harmful Contents
                                                                                                                    6L

Types of Portland Cement – ordinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, super sulphated cement, white cement   4L

Aggregates – Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modules, Grading Requirements. Testing of Aggregates – Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value   8L

Properties of Fresh Concrete – Workability, Factors Affecting Workability, Slump Test Compacting Factor Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, Curing methods, Maturity.   6L

Strength of Concrete – Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modulus of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders, Introduction to Non-Destructive Tests (Rebound hammer & Ultrasonic pulse velocity)   6L

Admixtures – different types, effects, uses, Retarders and Super plasticizers. Mix Design by I.S. 20262 (2009). Light-weight, Polymer and Fibre-reinforced concrete   6L

Text & References

1 Concrete Technology Neville Pearson Education
2 Concrete Technology M.S. Shetty S.Chand
3 Concrete Technology A. R. Santakumar OXFORD University Press
4 Concrete Technology M.L. Gambhir Tata McGraw Hill
5 Text book of Concrete Technology P.D. Kulkarni Tata McGraw Hill

ENGINEERING GEOLOGY
CODE: CE 504
CONTRACTS: 3L
CREDITS: 3

1. Geology and its importance in Civil Engineering.   2L

2. Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals.   3L

3. Classification of rocks:
Igneous rocks: Origin, mode of occurrence, forms & texture, classification and engineering importance. Sedimentary rocks: Process of sedimentation, classification and engineering importance. Metamorphic rocks: Agents and types of metamorphism, classification and engineering importance.   4L

4. Weathering of rocks: Agents and kinds of weathering, soil formation & classification based on origin.   2L

5. Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition.   1L

6. Structural geology: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering.   4L

7. Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercelli's intensity scale and Richter's scale of magnitude.   3L

8. Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive resistance.   3L

9. Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing. 3L

10. Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method field procedure – sounding and profiling, electrode configuration, and interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects. 4L

11. Applied Geology: Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations. 4L

12. Landslides: Types of landslides, causes, effects and prevention of landslides. 3L

Text & References

1 Engineering and General Geology Parvin Singh Katson publishing house Delhi 1987
2 Engineering Geology for Civil Engineers D. Venkat Reddy, Oxford, IBH, 1995.
3 Principles of petrology Tyrell Asia, Bombay
4 Structural Geology Marland P. Billings Wiley eastern Prentice-Hall, U.S.A.
5 Ground Water hydrology Todd D.K. John Wiley & Sons, Second edition, 1980.

Practical

SOIL MECHANICS LAB.-II
CODE: CE591
CONTACT: 3P
CREDIT: 2

1. Determination of compressibility characteristics of soil by Oedometer test (co-efficient of consolidation & compression Index)
2. Determination of unconfined compressive strength of soil
3. Determination of Shear parameter of soil by Direct shear test
4. Determination of undrained shear strength of soil by Vane shear test.
5. Determination of shear parameter of soil by Triaxial test (UU)
6. Standard Penetration Test
Expt No. 6 by large groups in the field.

References

1. Soil testing by T.W. Lamb (John Willey)
2. SP-36 (Part-I & Part –II)
3. Soil Mechanics Laboratory Manual by B. M. Das, OXFORD UNIVERSITY PRESS
4. Measurement of engineering properties of soil by E.Jaibaba Reddy & K. Ramasastri.

CONCRETE LABORATORY
CODE: CE 592
CONTACT: 3P
CREDITS: 2

1. Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes
2. Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modules, moisture content, bulk density and deleterious materials.
3. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
4. Tests on Fresh Concrete: Workability: Slump, Vee-Bee, Compaction factor tests
5. Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure tests , Non destructive testing (Rebound hammer & Ultrasonic pulse velocity)
6. Mix Design of Concrete.

References:

1. Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23]
2. Laboratory manual of concrete testing by V.V. Sastry and M. L. Gambhir

QUANTITY SURVEYING, SPECIFICATION AND VALUATION
CODE: CE 593
CONTACT: 3P
CREDITS: 2

Quantity Surveying: Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment.

Quantity estimate of a single storied building

Bar bending schedule.

Details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities.

Estimate of quantities of road, Underground reservoir, Surface drain, Septic tank.

Analysis and schedule of rates: Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring and finishing,

Specification of materials: Brick, cement, fine and coarse aggregates

Specification of works: Plain cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, colour washing, distempering, lime punning, painting and varnishing

Valuation: Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalized value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table .

References:

1. Estimating, costing, Specification and Valuation in Civil Engineering by M..Chakroborty
2. Estimating and Costing in Civil Engineering" by B.N.Dutta, USB Publishers & Distributers
3. Civil Estimating, Costing and Valuation by Agarwal / Upadhay

ENGINEERING GEOLOGY LAB
CODE: CE 594
CONTACT: 3P
CREDITS: 2

Serial No Experiment on

1. Study of crystals with the help of crystal models
2. Identification of Rocks and Minerals [Hand Specimens]
3. Microscopic study of Rocks and minerals
4. Study of Geological maps, interpretation of geological structures Thickness problems, Bore-hole Problems

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SEMESTER VI
THEORY

</div>

PRINCIPLES OF MANAGEMENT
CODE: HU601
CONTACT: 2L
CREDITS: 2

Module-I

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.

Module-II

3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.

5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-III

6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

Module-IV
9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:

1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson)
4.Management - Ghuman, Tata McGraw Hill(TMH)

MICROBIAL TECHNOLOGY & FOOD BIOTECHNOLOGY
CODE: FT 604
CONTRACTS: 3L
CREDITS: 3

Module I (10L):

Methods for the microbiological examination of water and foods; Control of Microbiological quality and safety; Food borne illnesses and diseases

Module II (10L):

Microbial cultures for food fermentation, their maintenance, strain development; Production of organic acids (vinegar, lactic acid), alcoholic beverages (beer, wine, and distilled alcoholic beverages such as whiskey, rum, vodka), glycerol

Module III (10L):

Propagation of baker's yeasts; Microbial production of vitamins (B2 and B12), antibiotics (penicillin, streptomycin, tetracycline); Enzymatic production of glucose, fructose, starch, SCP and mushrooms

Module IV (10L):

Basics of microbial genetics – Gene, DNA, RNA; Replication, transcription, transformation, transduction, conjugation; Regulation of gene expression; Application in GM foods.

Revision: 5L

Books:
1. Industrial Microbiology Prescott & Dunn, CBS Publishers
2. Modern Food Microbiology by Jay JM, CBS Publishers
3. Comprehensive Biotechnology by Murray & Mooyoung, Academic press
4. Industrial Microbiology by Casida L.R., New Age International Pvt. Ltd.
5. Food Microbiology; Frazier WC; 4th ed, Tata-McGrowhill Pub.
6. Microbiology by Pelczar, Chan, and Krieg, TMH
7. Fermentation Biotechnology, Principles, Processed Products by Ward OP, Open University Press.

DESIGN OF STEEL STRUCTURE
CODE: CE602
CONTACT: 3L
CREDITS: 3

Details of Course Content

1 Materials and Specification :-Rolled steel section, types of structural steel , specifications 2L

2 Structure connections: Riveted, welded and bolted including High strength friction grip bolted joints.
i) types of riveted & bolted joints, assumptions, failure of joints ,efficiency of joints, design of bolted ,riveted & welded joints for axial load.
ii) Eccentric connection:- Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.   8L

3 Tension members: Design of tension members, I.S code provisions. Permissible stresses, Design rules, Examples.   3L

4 Compression members: Effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Design of one component, two components and built up compression members under axial load. Examples. Built up columns under eccentric loading: Design of lacing and batten plates, Different types of Column Bases- Slab Base, Gusseted Base, Connection details   8L

5 Beams: Permissible stresses in bending, compression and tension. Design of rolled steel sections, plated beams. simple Beam end connections, beam -Column connections. I.S code provisions   4L

6 Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded& bolted.   6L

7 Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions. 5L

Text & References:

1 Design of Steel structures N. Subramanian Oxford University Press
2 Design Of Steel Structures - S.K.Duggal Tata Mc-Graw Hill , New Delhi New Delhi
3 Design of steel structures A.S.Arya and J.L.Ajmani Nemchand& Bros.,
4 Design of steel structures, Vol. I & II Ramachandra
5 Design of steel structures PasalaDayaratnam – A.H.Wheeler& Co Ltd. 1990
6 Design of steel structures B.S.Krishnamachar and D.AjithaSinha –Tata McGraw – Hill publishing Co.Delhi.
7 Design of steel structures Ramamurtham
8 IS 800 – 2007(Latest Revised code) Bureau of Indian Standard
9 S.P.: 6(1) – 1964 Structural Steel Sections Bureau of Indian Standard

CONSTRUCTION PLANNING & MANAGEMENT
CODE: CE 603
CONTACT: 3L
CREDITS: 3

1 **Planning**: General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, acclusion   2L

2 **Regulation and Bye laws** : Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks , ventilation, Requirements for stairs, lifts in public assembly building, offices   4L

3 **Fire Protection**: Fire fighting arrangements in public assembly buildings, planning , offices, Auditorium   2L

4 **Construction plants & Equipment**: Plants & equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants &Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control   8L

5 **Planning &Scheduling of constructions Projects:**
Planning by CPM &PERT,Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time, probability of completion of project, Estimation of critical path, problems.   8L

6 **Management**: Professional practice, Defination, Rights and responsibilities of owner, engineer, Contractors, types of contract   4L

7 **Departmental Procedures:** Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbritation   8L

* Serial 1, 2, 3 are as per National Building Code

Text & References:

1 Construction Planning, Equipments and methods Puerifoy, R.L. McGraw Hill.
2 Management in construction industry P.P.Dharwadkar Oxford and IBH Publishing company New Delhi
3 Construction Management, Critical path Methods in Construction, J.O.Brien Wiley Interscience
4 PERT and CPM L.S. Srinath
5 Project planning and control with PERT and CPM' Construction equipments and its management B.C.Punmia and K.K.Kandelwal S.C.Sharma
6 National Building code BIS

PROFESSIONAL ELECTIVE - I

SOLID & HAZZARDS WASTE TREATMENT
CODE: CVE 601 A
CONTACTS: 3L
CREDITS: 3

Objective of the course: Be familiar with Solid and Hazardous wastes for both national and intl. scenarios and their treatment and management methods
Pre-requisite: Basic Environmental Engineering

Module 1   Definition of Hazardous wastes, National and Intl laws and regs
                "Cradle to grave" concept, technology financial constraints,
                Indian Scenario [10L]
Module 2   Definition of solid wastes, landfill design, leachate problems
                [9L]

Module 3   Biological Treatment of solid and Haz wastes[10L]

Module 4   Physico-chemical treatment of solid and Haz wastes[8L]

Module 5   Innovative Technologies for solid and hazardous wastes[8]

INDUSTRIAL WASTE TREATMENT
CODE: CVE 601 B
CONTACTS: 3L
CREDITS: 3

Objective of the course: Application of Environmental Treatment technologies to specific industrial wastes
Pre-requisite: Basic knowledge of Physico-chemical and Biological Treatment
Detailed Course Outlines:

Module 1   Source and characteristics of Industrial wastes[10L]

Module 2   Pre and Primary treatment[9L]

Module 3   Biological and Physico-chemical processes for industrial wastes[10L]

Module 4   Case studies[8L]

Module 5   Innovative processes for industrial treatment[8L]

FREE ELECTIVE – I

OPERATION RESEARCH
CODE: CVE 602 A
CONTACT: 3L
CREDITS: 3

Module I
Linear Programming Problems (LPP):
Basic LPP and Applications; Various Components of LP Problem Formulation.
Solution of Linear Programming Problems:
Solution of LPP: Using Simultaneous Equations and Graphical Method;
Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples.   **5L**
Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory.Transportation Problems and Assignment Problems.   **12L**

Module II
Network Analysis:
Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded).   **6L**

Inventory Control:
Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.
3L

Module III
Game Theory:
Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance. **5L**

Module IV
Queuing Theory:
Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems. **5L**

Text Books:

1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

References:

1. KantiSwaroop — "Operations Research", Sultan Chand & Sons
2. Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
3. R. Panneerselvam - "Operations Research", PHI
4. A.M. Natarajan, P. Balasubramani and A. Tamilarasi - "Operations Research", Pearson
5. M. V. Durga Prasad – "Operations Research", CENGAGE Learning
6. J. K. Sharma - "Operations Research", Macmillan Publishing Company

HUMAN RESOURCE MANAGEMENT (HSS)
CODE: CVE 602 B
CONTACT: 3L
CREDITS: 3

Introduction : HR Role and Functions, Concept and Significance of HR, Changing role of HR managers - HR functions and Global Environment, role of a HR Manager.

Human Resources Planning : HR Planning and Recruitment: Planning Process - planning at different levels - Job Analysis - Recruitment and selection processes - Restructuring strategies - Recruitment-Sources of Recruitment-Selection Process- Placement and Induction-Retention of Employees.

Training and Development : need for skill upgradation - Assessment of training needs - Retraining and Redeployment methods and techniques of training employees and executives - performance appraisal systems.

Performance Management System : Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors-Competency management.

Industrial Relations : Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management.

Case study.

Books :

1. Gary Dessler, Human Resource Management - (8th ed.,) Pearson Education, Delhi
2. Decenzo& Robbins, Personnel / Human Resource Management, 3rd ed., John Wiley & Sons (Pvt.) Ltd.
3. BiswajeetPatanayak, Human Resource Management, PHI, New Delhi
4. Luis R. Gomez, Mejia, Balkin and Cardy, Managing Human Resources PHI, New Delhi.

MATERIALS HANDLING
CODE: CVE 602 C
Contacts: 3L
Credits- 3

1 Introduction: Definition, importance and scope of materials handling (MH); classification of materials; codification of bulk materials ; utility of following principles of MH – (i) materials flow, (ii) simplification, (iii) gravity, (iv) space utilization, (v) unit size, (vi) safety, (vii) standardization, (viii) dead-weight, (ix) idle time, (x) motion.   4L

2A Unit load: Definition; advantages & disadvantages of unitization; unitization by use of platform, container, rack, sheet, bag and self contained unit load; descriptive specification and use of pallets, skids, containers, boxes, crates and cartons; shrink and stretch wrapping.   3L

2B Classification of MH Equipment: Types of equipment –
(i) industrial trucks & vehicles, (ii) conveyors, (iii) hoisting equipment, (iv) robotic handling system and (v) auxiliary equipment; Independent equipment wise sub classification of each of above type of equipment.   3L

3 Industrial trucks & vehicles : Constructional features and use of the following equipment –
(i) wheeled hand truck, (ii) hand pallet truck, (iii) fork lift truck; Major specifications, capacity rating and attachments of fork lift truck.   5L
4 Conveyors: Use and characteristics of belt conveyor, constructional features of flat and troughed belt conveyor; Use and constructional features of Flg. types of chain conveyors – (i) apron, car and trolley type; Construction of link-plate chains; Dynamic phenomena in chain

drive; Use and constructional features of roller conveyors; Gravity and powered roller conveyor; Pneumatic conveyor-use and advantages; Positive, negative and combination system of pneumatic conveyors; constructional feature, application and conveying capacity of screw conveyor.   8L

5 Hoisting Equipment: Advantage of using steel wire rope over chain; constructional features of wire ropes; Rope drum design; Pulley system-simple vs. multiple pulley; Load handling attachments : hooks, grabs, tongs, grab bucket; Arrangement of hook suspension with cross piece and pulleys (sheaves); Use and constructional features of (i) hand operated trolley hoist , (ii) winch; (iii) bucket elevator, (iv) Jib crane, (v) overhead traveling crane and (vi) wharf crane; Level luffing system of a wharf crane; Utility of truck mounted and crawler crane.   8L

6A Robotic handling: Materials handling at workplace; Major components of a robot; Applications of robotic handling.   2L

6B Auxiliary Equipment: Descriptive specification and use of – (i) Slide and trough gates, (ii) belt, screw and vibratory feeders,
(iii) Chutes, (iv) positioners like elevating platform, ramps, universal vise; (v) ball table.   3L

Books Recommended:

1. S. Ray, Introduction to Materials Handling, New Age Int. Pub.
2. T. K. Ray, Mechanical Handling of Materials, Asian Books Pvt. Ltd.
3. T.H. Allegri, Materials Handling: Principles and Practices, CBS Publishers and Distributors.
4. J.A. Apple, Material Handling System Design, John Wiley & Sons.

PRACTICAL

ENVIROMENTAL CHEMISTRY LAB
CODE: CVE 691
CONTACTS: 3P
CREDITS: 2

Objective of the course: Develop hands on experience in environmental analysis
Pre-requisite: Introduction to Environmental Engineering

Module 1   pH and alkalinity, titration curves, buffers

Module 2   COD measurement

Module 3   DO and BOD

Module 4   Heavy metals, Fe and Mn

Module 5   Volatile acids, sulfate, gas measurements Microbial analysis

MICROBIAL TECHNOLOGY LAB
CODE: FT 692
CONTACTS: 4P
CREDITS: 2

1. Alcohol fermentation
2. Organic acid fermentation – Vinegar / citric / lactic acid production
3. Propagation of baker's yeast
4. Fermented dairy products
5. Production of antibiotics
6. Enzyme preparation
7. Amino acid production
8. Vitamin B12 production

CAD LABORATORY
CODE: CE 693
CONTACT: 3P
CREDITS: 2

Introduction and important features ofa software dealing with analysis and design of structures Analysis and design of a multistoried building using software, Preparation of detailed drawings of different structural elements including ductility detailing RCC Slab, beam, column and footing design.

SEMESTER VII
THEORY

ENVIRONMENTAL ENGINEERING
CODE: CE 701
CONTACT: 3L
CREDITS: 3

1 Water Demand Water demands; Per capita demand; Variations in demand; Factors affecting demand;Design period; Population Forecasting   3L

2 Sources of Water Surface water sources; ground water sources   2L

3 Water Quality Impurities in water; Water quality parameters; Standards for potable water 2L

4 Conveyance of Water Hydraulic design of pressure pipes   2L

5 Water Treatment Typical flow chart for surface and ground water treatments; Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration,Disinfection. 8L

6 Water Distribution Analysis of distribution network; Storage and distribution reservoirs; Capacity of reservoirs   4L

7 Sewage and Drainage Definition of Common Terms, Quantity estimation for sanitary sewage and storm sewage   3L

8 Sewer Design Hydraulic design of sewers, Partial flow diagrams and Nomograms   3L

9 Wastewater Characteristics Physical, chemical and biological characteristics, DO, BOD and COD   3L

10 Wastewater Treatment Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic Tank   6L

References:

1 Environmental Engineering, S.K .Garg, Khanna Publishers
2 Water Supply, Waste Disposal and Environmental Pollution Engineering, , A.K.Chatterjee Khanna Publishers.
3 Environmental Engineering, Vol.II, P. N. Modi,
4 Environmental Modelling, , Rajagopalan Oxford University Press.
5 Environmental Engineering P. V. Rowe TMH

WATER RESOURCE ENGINEERING
CODE: CE 702
CONTACT: 3L
CREDITS: 3

1 **Water Demand** Water demands; Per capita demand; Variations in demand; Factors affecting demand;Design period; Population Forecasting   3L

2 **Sources of Water** Surface water sources; ground water sources   2L

3 **Water Quality** Impurities in water; Water quality parameters; Standards for potable water 2L

4 **Conveyance of water** Hydraulic design of pressurepipes   2L

5 **Water Treatment** Typical flow chart for surface and ground water treatments; Aeration, Plain sedimentation, Sedimentation with coagulation, Water Softening, Filtration,Disinfection. 8L

6 **Water Distribution** Analysis of distribution network;Storage and distribution reservoirs; Capacity of reservoirs   4L

7 **Sewage and Drainage** Definition of Common Terms, Quantity estimation for sanitary sewage and storm sewage   3L

8 **Sewer Design** Hydraulic design of sewers, Partial flow diagrams and Nomograms   3L

9 **Wastewater Characteristics** Physical, chemical and biological characteristics, DO, BOD and COD   3L

10 **Wastewater Treatment** Typical flow chart for wastewater treatment; Primary Treatments; Secondary Treatments: Activated Sludge Process, Trickling Filter Process, Septic Tank

6L

References

1 Engineering Hydrology K. Subramanya Tata McGraw-Hill
2 A Text Book of Hydrology- P. Jaya Ram Reddy Laxmi Publications-New Delhi
3 Hydrology & Water Resource Engineering- S.K Garg Khanna Publishers.
4 Hydrology Principles, Analysis and Design H. M. Raghunath. .
5 Hydraulics of Groundwater J. Bear McGraw-Hill
6 Water Resources Engineering Through Objective Questions K. Subramanya Tata McGraw-Hill
7 Irrigation & Water Power Engineering- B.C Purnia, S Pande- Standard Publication-New Delhi.
8 Irrigation Engineering G.L Aswa Wiley Eastern-New Delhi
9 Irrigation, Water Resource & Water Power
Enginee ring-. Dr. P.N Modi- Standard Book House-New Delhi Module Details of Course

PROFESSIONAL ELECTIVE –II

SOIL STABILIZATION AND GROUND IMPROVEMENT TECHNIQUES
CODE: CVE 701 A
CONTACT: 3L
CREDITS: 3

Soil Stabilization: Introduction, Stabilization of soil with granular skeleton and soil without granular skeleton, common nomenclature of stabilized soil systems and stabilization methods, specific methods of soil stabilization: Stabilization with cement, lime fly-ash   8L

Insitu densification: Introduction, Compaction: methods and controls *Densification of granular soil***:** Vibration at ground surface, Impact at ground surface, Vibration at depth (Vibroflotation), Impact at depth. *Densification of Cohesive Soils*: Preloading and dewatering, Design of Sand drains and Stone columns, Electrical and thermal methods.   12L

Geo-textiles: Over view: Geotextiles as separators, reinforcement. Geotextiles in filtration and drainage, geotextiles in erosion control.   6L

Grouting: Over view: Suspension and Solution grout, Grouting equipment and methods, Grout design and layout, Grout monitoring schemes.   6L

Soil stability: Reinforced earth fundamentals, Soil nailing, Soil and Rock Anchors, Underpinning   4L

1 Foundation Analysis & Design J.E. Bowels McGraw Hill
2 Principles of Foundation Engineering B.M. Das Thomson Book
3 Foundation Design Manual N. V. Nayak Dhanpat Rai Publication Pvt. Ltd
4 Construction and Geotechnical methods in foundation engineeringR.M. Koener McGraw Hill
5 Technology in tunnelling and dam construction A.V. Shroff. & D.L. Shah Oxford and IBH Publishing Co.Pvt.Ltd
6 Reinforced Earth T S Ingold Thoam Telford
7 Designing with Geosynthetics R M Koerner Prentice Hall

ADVANCED HIGHWAY &TRANSPORTATION ENGINEERING
CODE: CVE 701B
CONTACT: 3L
CREDITS: 3

1 Traffic Engineering: Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections – Basic traffic conflicts, classification of at-grade intersections, channelization, rotaries, traffic signals, signs and marking; Road Safety; Traffic System Management.   12L

2 Transportation planning : Transportation planning at different levels; Transport Project planning– Planning studies and investigation; Elements of Urban Transportation Planning; Transport Demand Analysis; Preparation of Project Report   8L

3 Railway Engineering : Location surveys & alignment, Permanent way components, Gauges, Geometric Design, Points & crossings, Stations & Yards, Signalling, Track Maintenance 8L

4 Airport Engineering : Functional areas of airports: Runways, Taxiways, , Aprons, Terminal buildings; Classification of Airports; Airport site selection; Design of Runway, Runway orientation, Wind Rose diagram; Design of Taxiway and Terminal Building   8L

References

1 Transportation Engineering Khisty and Lal PHI
2 A Text Book of Railway Engineering S.P. Arora& S.C. Saxena
3 **Railway Engineering** Satish Chandra Oxford University press
4 **Transportation Engineering Vazirani&Chandola**
5 Airport planning and Design S.K.Khanna&M.G.Arora

6 Airport Transportation Planning & Design-. Virendra Kumar &Satish Chandra Galgotia Publication Pvt. Ltd. New Delhi

PROFESSIONAL ELECTIVE III

ADVANCED STRUCTURAL ANALYSIS
CODE: CVE 702A
CONTACT: 3L
CREDITS: 3

1 Review of analysis of indeterminate structures; Force methods: Statically indeterminate structures (method of consistent deformations; theorem of least work) Displacement Methods: Kinematically indeterminate structures (slope-deflection method; moment distribution method).
Matrix concepts and Matrix analysis of structures: Introduction; coordinate systems; displacement and force transformation matrices; Contra-gradient principle; element and structure stiffness matrices; Element and structure flexibility matrices; equivalent joint loads; stiffness and flexibility approaches. Matrix analysis of structures with axial elements: Plane Truss; Analysis by flexibility method Space trusses: Matrix analysis of beams and grids: Flexibility method for fixed and continuous beams: Stiffness method for grids: Matrix analysis of plane and space frames: Flexibility method for plane frames: Stiffness method for space frames.   18L

2 Theory of Elasticity : Three dimensional stress and strain analysis, stress - strain transformation, stress invariants; equilibrium and compatibility equations, boundary conditions; Two dimensional problems in Cartesian, polar and curvilinear co-ordinates, bending of a beam, thick cylinder under pressure, complex variable, harmonic and bi-harmonic functions; Torsion of rectangular bars including hollow sections, bending problems; Energy principles, variational methods and numerical methods.   18L

References:
1 Matrix Methods of Structural Analysis M.B. Kanchi.
2 Analysis of Structures T.S. Thandavamoorthy Oxford University Press
3 Intermediate Structural Analysis C.K. Wang Mc Graw Hill
4 Theory of Elasticity Timoshenko & Goodier McGraw-Hill

HYDRAULIC STRUCTURES
CODE: CVE 702B
CONTACT: 3L
CREDITS: 3

1 Diversion Head works: Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site, layout and description of each part, Effects of construction of a weir on the river regime, causes of failure of weirs on permeable foundation and their remedies   4L

2 Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift, Bligh's creep theory of seepage flow, Khosla's theory & concept of flownets, concept of exit gradient and critical exit gradient, Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage, necessary corrections, examples.   6L

3 Hydraulic structures for canals: Canal falls – necessity, locations, types and description of Ogee fall, Trapezoidal-notch fall, Syphon well drop. Examples.   4L

4 Cross-Drainage Works: Necessity, types, selection of a suitable type (Introduction only) 4L

5 Dam (General): Definition, classification of Dams, factors governing selection of type of dam, selection of suitable site for a dam.   2L

Earthen Dams: Introduction, Types of Earthen Dams, Methods of Construction, Causes of failure, Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam, seepage control in Earthen Dam, Examples.   6L

6 Gravity Dam: Definition, Typical cross- section, Forces acting on Gravity Dam, Combination of forces for design, Mode of failure and criteria for structural stability of Gravity Dams, Principal and shear stresses. Elementary profile of a Gravity Dam, Concept of High and low Gravity Dam, Examples.   6L

Spillways: Types, Location, Essential requirements, spillway capacity. Components of spillway, Energy Dissipators, Stilling basins (Indian standard).   4L

References

1 Irrigation Engineering and hydraulic structures. Santosh Kumar Garg Khanna Publishers.
2 Irrigation, water Resources and Water Power Engg. Dr.P.N. Modi, Standard Book House, Delhi-6
3 Water Resources Engineering Principle and practice By SatyaNarayana Murthy Challa. New Age Internation (P) Ltd. Publishers. New delhi,
4 Design of Small Dams. US Department of the Interior Bureau of Reclamation.
McGraw Hill
5 Concrete Danms R.S. Varsney, Oxford & I & H Publishing Co. New Delhi

CLIMATE & OCEAN CURRENTS
CODE: CVE702C
CONTACTS: 3L
CREDITS: 3

Objective of the course: Be familiar with climate and ocean currents to understand the real issues of global warming
Pre-requisite: Basic physics, chemistry and world geography
Detailed Course Outlines:

Module 1	Weather and climate, earth-sun geometry, geo-clock [10L]
Module 2	Surface energy budget, atm. Moisture [10L]
Module 3	Cloud droplets and raindrops, cyclones and hurricanes[9L]
Module 4	Ocean currents and their impact on climate[9L]
Module 5	Climate variability and change, world climates, global effects [8L]

FREE ELECTIVE - II

ENGINEERING MATERIALS
CODE: CVE 703A
CONTACT: 3L
CREDITS: 3

1. **Introduction:** Material Science—its importance in engineering; Classification of Materials—metals, polymers, ceramics, composites; Advanced materials—semiconductors, smart materials, nano-materials; Review atomic structure, Atomic bonding in solids—bonding forces and energies; ionic/covalent/metallic bonding. 2L

2. **Crystal Structure:** Fundamental concepts; Unit cells; seven crystal systems; single crystal, polycrystalline and non-crystalline materials; Metallic crystal structures—FCC, atomic packing factor, BCC & HCP structures. 2L

3. **Imperfections in Metals:** Point defects due to vacancy & impurities, alloys, solid solutions; Dislocations—linear defects, interfacial defects, grain boundaries. 2L

4. **Phase Diagrams:** Definition and basic concepts; solubility limit; Phase equilibria, on component phase diagram, binary phase diagram, interpretation of phase diagrams. 3L

5. **Iron-carbon System:** allotropy of iron, iron-iron carbide phase diagram, properties and uses of plain carbon steel. 2L

6. **Classification of Metals and Alloys- compositions, general properties and uses:**
6.1 Ferrous alloys: Classification –low carbon steels, medium carbon steels, high carbon steels, stainless steels, alloy steels, tool and die steel, cast irons.
6.2 Non-ferrous alloys: Copper & Copper alloys; Aluminum alloys; Zinc alloys; Nickel alloys; Lead & Tin alloys; 6L

7. **Mechanical Properties of Materials:** Elastic properties of materials—tensile and compressive stress and strain, stress-strain behaviour, modulus of elasticity (Young's modulus),

yield strength, tensile strength, plastic deformation, true stress and strain; Ductility; Resilience; Toughness, impact tests; Hardness- Brinell, Rockwell and Vickers hardness and their testing procedures, correlation between hardness and tensile strength; Fatigue strength; Effect of temperature on tensile strength & impact properties, creep failure. 6L

8. **Heat Treatment:** Definition and purposes; Heat treatment processes for steels—Hardening, structural change during heating and cooling, factors affecting hardening; Tempering; Austempering; Normalizing; Annealing—full annealing, spheroidising annealing, stress–relieving, recrystallisation annealing; Preciptation or Age Hardening of non-ferrous alloys.4L

9. **Polymers & Elastomers:** Definition; How polymers are made- polymerization; Polymer molecular structures; Thermoplastics & Thermosets; Special characteristics like low sp. gravity, optical, electrical & thermal property, decorative color, easy formability, low corrosion etc; Uses of polymers and elastomers. 2L

10. **Ceramic Materials**: What is ceramics; common ceramic materials and their characteristics; How ceramics are made—sintering and vitrification process; Ceramic structures; Properties and applications. 2L

11. **Composite materials:** What is composites; Polymers matrix and their applications; Metal matrix and ceramic matrix composites and their applications; How composites are made. 2L

12. **Corrosion and Degradation of Engineering Materials:** Definition; Types of corrosion—uniform, pitting, crevice, galvanic, stress corrosion cracking and erosion; Corrosion control — material selection, environment control, proper design. 2L

13. **Materials Selection Methodology:** Selection of material based on required properties, availability and cost of material, environmental issues. 1L

Books Recommended

1. Materials Science and Engineering by W.D. Callister and adapted by R. Balasubramaniam, Willey India, 2010 Ed.
2. Engineering Materials: properties and selection by Budinski & Budinski, 9th Ed., Prentice Hall India
3. Engineering Materials and Metallurgy by R.Srinivasan, 2nd Ed., Tata McGraw Hill.
4. Materials & Processes in Manufacturing by E.P.Degarmo and adapted by Black & Kosher, 10th Ed., Wiley India.
5. Materials Science and Engineering by V.Raghavan, 5th Ed., Prentice Hall India.

ELECTRICAL & ELECTRONIC MEASUREMENT
CODE: CVE 703 B
CONTACT: 3L
CREDITS: 3

Module-I [9L]
Measurements:
• Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.
Analog meters:
• General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments
• Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.

Module-II [11L]
Instrument transformer:
• Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors.
Measurement of Power:
• Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.
Measurement of resistance:
• Measurement of medium, low and high resistances, Megger.

Module-III [11L]
Measurement of Energy:
• Construction, theory and application of AC energy meter, testing of energy meters.
Potentiometer:
• Principle of operation and application of Crompton's DC potentiometer, Polar and Coordinate type AC potentiometer. Application.
AC Bridges:
• Measurement of Inductance, Capacitance and frequency by AC bridges.

Module-IV [10L]
Cathode ray oscilloscope (CRO):
• Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.
Electronic Instruments:
• Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.
Sensors & Transducers:
• Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.

Text Books:

1. A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & sons.
2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing.
3. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.

Reference Books:

1. Sensors & Transducers, D. Patranabis, PHI, 2nd edition.
2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill.
3. Modern Electronic instrumentation & Measuring instruments, A.D. Heltric & W.C. Copper, Wheeler Publication.
4. Instrument transducers, H.K.P. Neubert, Oxford University press.

PRACTICAL

GROUP DISCUSSION
CODE: HU 781
CONTACT: 3P
CREDITS: 2

Will be implemented latter.

ENVIRONMENTAL ENGINEERING LAB
CODE: CE 791
CONTACT: 3P
CRDIT: 2

1. Determination of turbidity for a given sample of water Physical
2. Determination of color for a given sample of water
3 Determination of solids in a given sample of water: Total Solids, Suspended Solids and dissolved Solids
4 Determination of pH for a given sample of water Chemical
5 Determination of concentration of Chlorides in a given sample of water
6 Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water
7 Determination of hardness for a given sample of water
8 Determination of concentration of Fluorides in a given sample of water
9 Determination of concentration of Iron in a given sample of water
10 Determination of the Optimum Alum Dose for a given sample of water through Jar Test
11 Determination of the Residual Chlorine in a given sample of water
12 Determination of the Chlorine Demand for a given sample of water
13 Determination of the Available Chlorine Percentage in a given sample of bleaching powder

14 Determination of amount of Dissolved Oxygen (DO) in a given sample of water
15 Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater
16 Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater
17 Determination of bacteriological quality of water: presumptive test, confirmative test and Determination of MPN Bacteriological

Note That,

Physical: Exp No.1 to 3.

Chemical: Exp. No. 4 to 16

Bacteriological: Exp. No. 17

ENVIRONMENTAL ENGINEERING PRACTICE SESSIONAL
CODE: CVE 791
CONTACT: 3P
CREDITS: 2

Each student will be assigned two projects to be completed in consultation with the professors throughout the semester. The students will have the option of suggesting their own projects. The objective is to perform independent projects.

FREE ELECTIVE LAB

MATERIAL TESTING LAB
CODE: CVE 792 A
CONTACT: 3P
CREDITS: 2

Impact tests: Charpy and Izod tests; Test for drawability of sheet metals through cupping test; Fatigue test of a typical sample.
Sample preparation and etching of ferrous and non-ferrous metals and alloys for metallographic observation; Experiments on heat treatment of carbon steels under different rates of cooling including quenching, and testing for the change in hardness and observing its microstructural changes through metallographic studies.
Observation of presence of surface/ sub-surface cracks using different non-destructive techniques, such as dye penetration (DP) test, magnaflux test, ultrasonic or eddy current test.
(At least six experiments must be conducted)

ELECTRICAL & ELECTRONICS MEASUREMENT LAB
CODE: CVE 792B
CONTACT: 3P
CREDITS: 2

List of Experiments:

1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electrothermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.
2. Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer.
3. Calibrate dynamometer type wattmeter by potentiometer.
4. Calibrate AC energy meter.
5. Measurement of resistance using Kelvin double bridge.
6. Measurement of power using Instrument transformer.
7. Measurement of power in Polyphase circuits.
8. Measurement of frequency by Wien Bridge.
9. Measurement of Inductance by Anderson bridge
10. Measurement of capacitance by De Sauty Bridge.
11. Measurement of capacitance by Schering Bridge.

CLIMATE & OCEAN CURRENTS LAB
CODE: CVE792C
CONTACTS: 3P
CREDITS: 2

Objective of the course: Develop Hands-on experience on climate studies
Pre-requisite: CVE 703
Detailed Course Outlines:

Module 1   Geoclock
             Surface energy budget

Module 2   Atmospheric moisture, cloud droplets

Module 3   Weather map analysis, cyclones and hurricanes

PROJECT PART 1

CODE: CVE 782
CONTACTS: 0
CREDITS: 2

Objective of the course: Be familiar with Civil Engineering projects with environmental importance
Pre-requisite: All courses in the syllabus up to Semester 6

Module 1   Civil Engineering Projects of Environmental Importance

Module 2   Example 1: Dams and their environmental impact

Module 3   Example 2: Design of environmentally favored buildings

Module 4   project to be selected by the student

Module 5   Project assigned to the student

SEMESTER VIII
THEORY

ORGANISATIONAL BEHAVIOUR
CODE: HU801A
CONTRACTS: 2L
CREDITS: 2

1. Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB.   [2L]
2. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.   [2L]
3. Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making.   [2L]
4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.   [4L]
5. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making.   [2L]
6. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication.   [2L]
7. Leadership: Definition, Importance, Theories of Leadership Styles.   [2L]
8. Organizational Politics: Definition, Factors contributing to Political Behaviour.   [2L]
9. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process.   [2L]
10. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.   [4L]

References:

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.

3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

Or

PROJECT MANAGEMENT
CODE: HU801B
CONTRACTS: 2L
CREDITS: 2

1. Project Management Concepts: Concept and Characteristics of a Project, Importance of Project Management. [1]
2. Project Planning: Project Evaluation, Financial Sources, Feasibility Studies. [4]
3. Project Scheduling: Importance of Project Scheduling, Work Breakdown Structure and Organization Breakdown Structure, Scheduling Techniques – Gantt Chart and LOB, Network Analysis – CPM/PERT. [6]
4. Time Cost Trade-off Analysis – Optimum Project Duration. [2]
5. Resource Allocation and Leveling. [2]
6. Project Life Cycle. [2]
7. Project Cost – Capital & Operating Costs, Project Life Cycle Costing, Project Cost Reduction Methods. [2]
8. Project Quality Management: Concept of Project Quality, TQM in Projects, Project Audit. [1]
9. Software Project Charateristics and Mangement [2]
10. IT in Projects: Overview of types of Softwares for Projects, Major Features of Project Management Softwares like MS Project, Criterion for Software Selection. [2]

References

1. Gopalkrishnan P. and Rama Mmoorthy: Text Book of Project Management, Macmillan
2. Nicholas John M.: Project Management for Business and Technology – Principles and Practice, Prentice Hall India, 2nd Edn.
3. Levy Ferdinand K., Wiest Jerome D.: A Management Guide to PERT/CPM with GERT/PDM/DCPM and other networks, Prentice Hall India, 2nd Edn.
4. Mantel Jr., Meredith J. R., Shafer S. M., Sutton M. M., Gopalan M. R.: Project Management: Core Text Book, Wiley India, 1st Indian Edn.
5. Maylor H.: Project Management, Pearson, 3rd Edn.
6. Nagarajan K.: Project Management, New Age International Publishers, 5th Edn.
7. Kelkar. S.A, Sotware Project Management: A concise Study, 2nd Ed., PHI

PROFESSIONAL ELECTIVE IV

ENVIRONMENTAL POLLUTION AND CONTROL
CODE: CVE 801A
CONTACT: 3L
CREDITS: 3

1. **Introduction**: Environment. Pollution, Pollution control   2L

2. **Air Pollution**: Air Pollutants: Types, Sources, Effects; Air Pollution Meteorology: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.   8L

3. **Air pollution Control**: Self cleansing properties of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles.   8L

4. **Noise Pollution:** Definition; Sound Pressure, Power and Intensity; Noise Measurement: Relationships among Pressure, Power and Intensity, Levels, Frequency Band, Decibel Addition, Measures of community Noise i.e. LN, Leq, Ldn,, LNP; Sources, ; Effects; Control.   4L

5. **Water pollution**: Pollution Characteristics of Typical Industries, Suggested Treatments. 4L

6. **Global Environmental Issues**: Ozone Depletion, Acid Rain, Global Warming-Green House Effects   4L

7. **Administrative Control on Environment:** Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects   4L

8. **Environmental Laws:** Water Act, Air Act, Motor Vehicle Act   2L

References:

1. Introduction to Environmental Engineering and Science G. Masters, W. Ela PHI
2 Environmental Engineering: A Design Approach A. Sincero, G. Sincero PHI
3 Environmental Engineering P. V. Rowe TMH
4 Environmental Engineering, S.K . Garg, Khanna Publishers
5 Air Polution Rao and Rao TMH
4 Water Supply, Waste Disposal and Environmental Pollution Engineering, , A.K.Chatterjee Khanna Publishers.
5 Environmental Engineering, Vol.II, P. N. Modi,
6 Environmental Modelling, , Rajagopalan Oxford University Press.

WATER RESOURCES MANAGEMENT & PLANNING
CODE: CVE 801B
CONTACT: 3L
CREDITS: 3

1 **Planning and analysis of Water Resource Systems**: Introduction, System Analysis, Engineers and Policymakers   3L

2 **Methods of Analysis:** Introduction, Evaluation of Time streams of Benefits and Costs. Plan formulation, Planning models and solution procedures, Lagranges Multipliers, Dynamic Programming, Recursive equations, Bellmans' principle of optimality. Curse of dimensionality of discrete dynamic programming. Examples   8L

3 **Reservoir Operation:** Sequential process, single Reservoir problem - with release as decision variable, with storage as decision variable (deterministic approach). Examples, Related Computer Programming. Multi–reservoir problems (Deterministic approach)   6L

4 **Water Resources Planning under Uncertainty:** Introduction, probability concepts and Methods – Random variable and Distributions, Univariate probability Distributions ,properties of Random variable – Moment and Expectation (Univariate Distributions) , Moment Generating Functions, Measures of Central tendency, Measures of Dispersion, Measures of symmetry (Skewness), measures of peakedness (kurtosis), examples   10L

5 **Stochastic River Basin Planning Model:** Introduction, Reservoir operation, Stochastic, Dynamic programming, Operating Model, Probability Distribution of Storage volumes and Releases, examples   6L

6 **Water quality Management:** Prediction and Simulation, Water quality Management Modeling   3L

References:

1 Applied Hydrology V.T. Chow
2 Hydrology Raudkivi
3 Stochastic Hydrology Jayarami Reddy
4 Water Resources Engg. M.C. Chaturvedi
5 Water Resources Systems Planning & Analysis Ddenice P Loucks, Jery R Stedinger& Douglas A Heinth Prentice Hall, Inc New Jersy.
6 Water Resources Engineering Larry W Mays John Wiley & Sons(Asia)

REMOTE SENSING AND GIS
CODE: CVE 801C
CONTACT: 3L
CREDITS: 3

Details of Course Content Hours Total
1 **Introduction:** Definition and types of remote sensing, Tacheometry (Planimetry/ altimetry), Triangulation (Frame work / adjustment), Trilateration (EDM/ Total Station), Geodetics (physical/ geometrical geodesy), Error Analysis (causes / law of weights), Numerical example 7L

2 **Photogrammetry:** Camera System (phototheodolite/ aircraft), Ground photograph (oblique/orthogonal streophoto), Aerial photograph (perspective scale/ flight planning), distortion (relief / tilt), Geometrix (parallax / mapping), application (topographics / interpretation), Numerical Examples   7L

3 **Satellite survey:** Satellite Sensing (Sensors / platforms), energy sources (electromagnetic / atmospheric interaction), visual interpretation (Band width), digital processing (imageries / enhancement), data integration (multi-approach / GIS), microwave imaging (active system / radars), applications   7L

4 **Astronomy:** Celestial sphere (star-coordinates / transformation), field astronomy (azimuth, solar and polar method), 3D computation (local vs global), spherical trigonometry, Multilateration, Observation, Corrections in astronomy, Correlation of low, medium, remote objects, Global Positioning Systems   7L

5 **Geoinformatics:** GIS concept (Introduction/ definition), planning and management, spatial data model, database and DBMS, linking of attributes, geospatial analysis, modern trends 8L

References:

1 Surveying (Volume 2): Duggal S.K. Tata McGraw Hill
2 Remote Sensing & GIS: Bhatta B. Oxford Univ Press
3 Geographic Information System: Tor Bern Herdgen Wiley
4 Surveying: Bannister, Raymond & Baker Pearson Education
5 Remote Sensing & Image Interpretation: Lilesand, Kiefer and Chipman Wiley
6 Surveying (Volume 2): Kanetker.&Kulkarni
7 Remote Sensing & Geographical information System Reddy M.A. (BS publication).
8 Advanced Surveying Rampal K.K.
9 Fundamantals of Geographic Information System: Demers M.N. (Wiley)

PROFESSIONAL ELECTIVE V

FINITE ELEMENT METHOD
CODE: CVE 802A
CONTACT: 3L
CREDITS: 3

1 Introduction to Finite ElementAnalysis: Introduction, Basic Concepts of Finite Element Analysis, Steps in Finite Element Analysis, Fundamental concepts of Elasticity   4L

2 Finite Element Formulation Techniques: Virtual Work and Variational Principle, GalerkinApproach, Displacement Approach, Stiffness Matrix and Boundary Conditions4L

3 Element properties: Concepts of shape functions: Natural Coordinates, one dimensional, Triangular, Rectangular Elements, Lagrange and Serendipity Elements Isoparametric Formulation: Isoparametric Elements, Stiffness Matrix of Isoparametric Elements,
Numerical Integration: One Dimensional, Two Dimensional   8L

4 Formation of stiffness matrices and analysisofTruss, Continuous Beam and Simple Plane Frame   6L

5 FEM for two dimensional analysis**:** Constant Strain Triangle, Linear Strain Triangle, Rectangular Elements, Numerical Evaluation of Element Stiffness, Computation of Stresses 6L

6 FEM for Plates : Introduction to Plate Bending Problems, Finite Element Analysis of Thin Plate   4L

7 Introduction to application of standard FEM software in civil Engineering   4L

References:

1 Finite Element Method with Applications in Engineering Y. Desai et. al Pearson
2 Introduction to Finite Element in Engineering Chandrapatla&Belegundu Pearson Education
3 A First Course in Finite Element Method D. L. Logan Thomson
4 Surveying: Bannister, Raymond & Baker Pearson Education
5 Concepts and Applications of Finite Element Analysis R. D. Cook et. al Wiley India
6 Finite Element Analysis – Theory and Programming C. S. Krishnamoorthy Tata Mcgraw Hill
7 Matrix, Finite Element,Computer and Structural Analysis M. Mukhopadhyay Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India
8 Finite Element Procedures K. J. Bathe PHI, New Delhi, India

PAVEMENT DESIGN
CODE: CVE 802B
CONTACT: 3L
CREDITS: 3

1 Principles of Pavement Design : Types of Pavements, Concept of pavement performance, Structuraland functional failure of pavement, Different types of pavement performance, Different pavementdesign approaches   6L

2 Traffic Consideration in Pavement Design : Vehicle types, Axle configurations, Contact shapes andcontact stress distribution, Concept of standard axle load, Vehicle damage factor, Axle load surveys,Estimation of design traffic   6L

3 Pavement Material Characterization : Identification of different type of materials Field and laboratory methods for characterization of pavement materials   8L

4 Analysis and Design of Flexible Pavements : Selection of appropriate theoretical model for flexiblepavements, Analysis of different layers of flexible pavements based on linear elastic theory,Different methods of design of flexible pavements, IRC guidelines(IRC-37)   6L

5 Analysis and Design of Rigid Pavements : Selection of appropriate theoretical models for rigid pavements, Analysis of wheel load stresses, curling, temperature differential, Critical stress combinations, Different methods of design of rigid pavements, IRC guidelines (IRC-58)   6L

6 Pavement Overlay Designs : Overlay design as per Indian Roads Congress guidelines (IRC-81) Overlay design as per AASHTO-1993 guidelines   4L

References:

1 Principles of Pavement Design E.J.Yoder and M.W. Witczak Wiley
2 Pavement Analysis and Design Y. H. Huang Prentice- Hall
3 Highway Engineering Khanna and Justo Nem Chand
4 IRC-37, IRC-58, IRC-73, IRC-81, IRC-106 and other relevant IRC codes Indian Roads Congress

PRACTICAL

ENVIRONMENTAL ENGINEERING DESIGN PRACTICE
(ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL LAWS)
CODE: CVE 891
CONTACTS: 6
CREDITS: 4

Objective of the course: Understanding the importance of EIA and development of EIA reports

Pre-requisite: Introduction to Environmental Engineering

Module 1   Environmental Impact Assessment, Environmental laws useful
              for EIA, How to write an EIA report

Module 2   Case Studies 1-5

Module 3   Field visit (at least one)

Module 4   Develop an EIA report based on the field visit

PROJECT PART II

CODE: CVE881
CONTACTS: 12
CREDITS: 6

Objective of the course: To develop problem solving skills for open-ended problems related to
Civil and Environmental Engineering
Pre-requisite: Complete all prior courses in the programme
Detailed Course Outlines: One final project report has to be submitted

GRAND VIVA
CODE: CVE 882
CONTACTS: 0
CREDITS: 3

Objective of the course: To assess the student for overall understanding of Civil and
Environmental Engineering with the help of external examiners following WBUT rules. es :
Plate girder bridges 12