

Syllabus for B.Tech(Civil Engineering) Second Year

Revised Syllabus of B.Tech CE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)



Civil Engineering Second Year – Third Semester

A. THEORY							
Sl. No	Field	Theory	Contact hours per week				Cr. Points
			L	T	P	Total	
1	HU301	Values & Ethics in Profession	3	0	0	3	3
2	PH301	Physics - 2	3	1	0	4	4
3	CH301	Basic Environmental Engineering & Elementary Biology	(2+1)	0	0	3	3
4	CE301	Solid Mechanics	3	0	0	3	3
5	CE302	Surveying	3	1	0	4	4
6	CE303	Building Material & Construction	3	1	0	4	4
Total Theory						21	21
B. PRACTICAL							
7	PH391	Physics - 2	0	0	3	3	2
8	CE391	Solid Mechanics	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 Practical						12	8
Total of Semester						33	29

Second Year – Fourth Semester

A. THEORY							
Sl. No	Field	Theory	Contact hours per week				Cr. Points
			L	T	P	Total	
1	M(CS)401	Numerical Methods	2	1	0	3	2
2	M402	Mathematics - 3	3	1	0	4	4
3	CE401	Fluid Mechanics	3	0	0	3	3
4	CE402	Structural Analysis	3	1	0	4	4
5	CE403	Soil Mechanics	3	1	0	4	4
Total Theory						18	17
B. PRACTICAL							
6	HU481	Technical Report Writing & Language Lab Practice	0	0	3	3	2
7	M(CS)491	Numerical Methods	0	0	2	2	1
8	CE491	Fluid Mechanics	0	0	3	3	2
9	CE492	Surveying Practice -II	0	0	3	3	2
10	CE493	Soil Mechanics Lab - I	0	0	3	3	2
Total Practical						14	9
Total of Semester						32	26

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VALUES & ETHICS IN PROFESSION

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 a 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 judgements; 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.

Physics 2

Code: PH-301

Contacts: 4L

Credit: 3+1

Module 1:

Vector Calculus:

1.1 Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates.

2L

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Module 2 :

Electricity

2.1 Coulombs law in vector form. Electrostatic field and its curl. Gauss's law in integral form and conversion to differential form . Electrostatic potential and field, Poisson's Eqn. Laplace's eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady current.

5L

2.2 Dielectrics-concept of polarization, the relation $D=\epsilon_0E+P$, Polarizability. Electronic polarization and polarization in monoatomic and polyatomic gases. 3L

Module 3:

Magnetostatics & Time Varying Field:

3. Lorentz force, force on a small current element placed in a magnetic field. Biot-Savart law and its applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form. Faraday's law of electro-magnetic induction in integral form and conversion to differential form. 3L

Module 4:

Electromagnetic Theory:

4.1 Concept of displacement current Maxwell's field equations, Maxwell's wave equation and its solution for free space. E.M. wave in a charge free conducting media, Skin depth, physical significance of Skin Depth, E.M. energy flow, & Poynting Vector.

6L

Module 5:

Quantum Mechanics:

5.1 Generalised coordinates, Lagrange's Equation of motion and Lagrangian, generalised force potential, momenta and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion. 4L

Course should be discussed along with physical problems of 1-D motion

5.2 Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function ψ (normalization and probability interpretation), Expectation values, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels. 9L

Module 6:

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Statistical Mechanics:

3.1 Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of blackbody radiation..

7L

Basic Environmental Engineering & Elementary Biology

Code: CH301

Contacts: 3L = 3

Credits: 3

General

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

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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 ozone modification. 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

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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} (18 hr 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.

De, A. K., "Environmental Chemistry", New Age International.

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SOLID MECHANICS

Code: CE301

Contact: 3L

Credits: 3

Mod	Details of Course Content	Hours	Total
I	Review of Basic Concepts of Stress and Strain: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.	9	42
	Beam Statics: Support reactions, concepts of redundancy, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams		
II	Symmetric Beam Bending: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, Bending and shear stress for regular sections, shear centre	13	
	Deflection of statically determinate beams: Fundamental concepts: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions: Direct integration solution		
III	Analysis of determinate plane trusses: Concepts of redundancy, Analysis by method of joints, method of sections	10	
	Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle		
IV	Introduction to thin cylindrical & spherical shells: Hoop stress and meridional - stress and volumetric changes.	10	
	Torsion: Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical; springs		
	Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae.		

References

Sl. No	Name	Author	Publishers
1	Elements of Strength of Material	S. P. Timoshenko & D. H. Young	EWP Pvt. Ltd
2	Engineering Mechanics of Solids	E. P. Popov	Pearson Education
3	Strength of Materials	R. Subramanian	OXFORD University Press
4	Strength of Material	Bansal	
5	Strength of Materials	S S Bhavikatti	Vikas Publishing House Pvt. Ltd
6	Strength of Material	A. Pytel & F. L. Singer	AWL Inc
7	Strength of Material	Ramamrutham	
8	Engineering Mechanics I by	J. L. Mariam	John Willey
9	Engineering Mechanics	I. H. Shames	PHI
10	Fundamentals of Strength of Material	Nag & Chandra	WIE

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SURVEYING

Code: CE302

Contact: 3L + 1T

Credits: 4

Mod	Details of Course Content	Hours	Total
I	Introduction: Definition, classification of surveying, objectives, principles of surveying	12	42
	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.		
II	Plane Table Surveying: Equipment, Orientation, Methods of Plane Tabling, Three Point Problems.	11	
	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		
III	Theodolite Surveying: Components of a Transit Theodolite, Measurement of horizontal and vertical Angles, Co-ordinates and traverse Table	11	
	Tacheometry: Definition, Details of stadia System, Determination of horizontal and vertical distance with Tacheometer- Staff held vertically and normal to the line of sight		
IV	Simple & Transition Curves: Definition, Degree of Curve, Elements of Simple Curve, Setting out by Linear method and Rankine's tangential method, Transition Curves.	8	
	Introduction to Total Station with Field applications		

References

Sl No.	Title	Author
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)

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BUILDING MATERIAL AND CONSTRUCTION

Code: CE303

Contact: 3L + 1 T

Credits: 4

Mod	Details of Course Content	Hours	Total
Material of Construction			
I	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.	13	
	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		
II	Mortars: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars	10	
	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		
Building Construction			42
III	Foundations: Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations	10	
	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		
IV	Stairs: Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case	9	
	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		

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References

Sl. No	Name	Author	Publishers
1	1. Building Materials	S.K. Duggal	
2	2. Building Materials	P.C. Varghese	PHI
3	Engineering Materials	S.C. Rangwala	
4	Concrete Technology	M. S. Shetty	
5	Concrete Technology]	A.M. Neville & J.J. Brooks	Pearson Education
6	Building Construction	B.C. Punmia	
7	Building Construction and Foundation Engineering	Jha and Sinha	

Practical

Code: PH-391
Contacts: (3P)
Credit: (2)

Group 1: Experiments on Electricity and Magnetism

1. Determination of dielectric constant of a given dielectric material.
3. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
4. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
5. Determination of specific charge (e/m) of electron by J.J. Thomson's method.

Group 2: Quantum Physics

6. Determination of Planck's constant using photocell.
7. Determination of Lande's factor using Electron spin resonance spectrometer.
8. Determination of Stefan's radiation constant
9. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
10. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

Group 3: Modern Physics

11. Determination of Hall co-efficient of semiconductors.
12. Determination of band gap of semiconductors.
13. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

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b) In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c] into electrical voltage and collect the data in a computer using phoenix or similar interface.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:

- i. Failure to perform each experiment mentioned in b] and c] should be compensated by two experiments mentioned in the above list.
- ii. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]
- iii. Experiment in b] and c] can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:

For Both Physics I and II

1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
4. Arthur Baiser (Perspective & Concept of Modern Physics)

Physics I (PH101/201)

Vibration and Waves

3. Kingsler and Frey
4. D.P. Roychaudhury
5. N.K. Bajaj (Waves and Oscillations)
6. K. Bhattacharya
7. R.P. Singh (Physics of Oscillations and Waves)
8. A.B. Gupta (College Physics Vol.II)
9. Chattopadhyaya and Rakshit (Vibration, Waves and Acoustics)

Optics

1. Möler (Physical Optics)
2. A.K. Ghatak
3. E. Hecht (Optics)
4. E. Hecht (Schaum Series)
5. F.A. Jenkins and H.E. White
6. Chita Ranjan Dasgupta (Degree Physics Vol 3)

Quantum Physics

1. Eisberg and Resnick
2. A.K. Ghatak and S. Lokenathan
3. S.N. Ghoshal (Introductory Quantum Mechanics)
4. E.E. Anderson (Modern Physics)
5. Haliday, Resnick and Crane (Physics vol.III)
6. Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography

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1. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2. A.J. Dekker
3. Ashcroft and Mermin
4. Ali Omar
5. R.L. Singhal
6. Jak Tareen and Trn Kutty (Basic course in Crystallography)

Laser and Holography

1. A.K. Ghatak and Thyagarajan (Laser)
2. Tarasov (Laser)
3. P.K. Chakraborty (Optics)
4. B. Ghosh and K.G. Majumder (Optics)
5. B.B. Laud (Laser and Non-linear Optics)
6. Bhattacharyya [Engineering Physics] Oxford

Physics II(PH 301)

Classical Mechanics (For Module 5.1 in PH 301)

- H. Goldstein
A.K. Roychaudhuri
R.G. Takwal and P.S. Puranik
Rana and Joag
M. Spiegel (Schaum Series)
J.C. Upadhya (Mechanics)

Electricity and Magnetism

2. Reitz, Milford and Christy
3. David J. Griffith
4. D. Chattopadhyay and P.C. Rakshit
5. Shadowitz (The Electromagnetic Field)

Quantum Mechanics

7. Eisberg and Resnick
8. A.K. Ghatak and S. Lokenathan
9. S.N. Ghoshal (Introductory Quantum Mechanics)
10. E.E. Anderson (Modern Physics)
11. Haliday, Resnick and Crane (Physics vol.III)
12. Binayak Dutta Roy [Elements of Quantum Mechanics]

Statistical Mechanics

1. Sears and Sallinger (Kinetic Theory, Thermodynamics and Statistical Thermodynamics)
2. Mondal (Statistical Physics)
3. S.N. Ghoshal (Atomic and Nuclear Physics)
4. Singh and Singh
5. B.B. Laud (Statistical Mechanics)
6. F. Reif (Statistical Mechanics)

Dielectrics

7. Bhattacharyya [Engineering Physics] Oxford

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Solid Mechanics Lab

Code:CE391

Contact – 3 P

Credits – 2

1. Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars)
2. Compression Test on Structural Materials: Timber, bricks and concrete cubes
3. Bending Test on Mild Steel
4. Torsion Test on Mild Steel Circular Bar
5. Hardness Tests on Ferrous and Non-Ferrous Metals: Brinnel and Rockwell Tests
6. Test on closely coiled helical spring
7. Impact Test: Izod and Charpy
8. Demonstration of Fatigue Test

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

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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

Sl No.	Title	Author
1	Principles of Building Drawing	Shah & Kale
2	Text Book of Building Construction	Sharma & Kaul
3	Building Construction	B C Punmia

Semester: IV

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. (4)

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

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3)

Numerical solution of a system of linear equations:

Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method. (6)

Numerical solution of Algebraic equation:

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

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

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).

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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.

Subject Name : MATHEMATICS

Code: M 402

Contacts: 3L +1T = 4

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)

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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: $\int_0^{\infty} \frac{\sin x}{x} dx$, $\int_0^{2\pi} \frac{d\theta}{a + b \cos \theta + c \sin \theta}$, $\oint_C \frac{P(z)}{Q(z)} dz$ (elementary cases, $P(z)$ & $Q(z)$ are polynomials of 2nd order or less). (2)

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) $P(A^c)=1-P(A)$ 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.

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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 $P_0 y'' + P_1 y' + P_2 y = 0$ 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)

TOTAL LECTURES : 42

Text Books:

2. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
3. Das N.G.: Statistical Methods, TMH.
4. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
5. James G.: Advanced Modern Engineering Mathematics, Pearson Education.
6. 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.

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Fluid Mechanics

Code:CE401

Contact: 3L

Credits: 3

Sl. No	Details of Course Content	Hours	Total
1	Fluid statics: Forces on plane and curved surfaces, Center of pressure. Stability of floating bodies, Metacentre.	4	42
2	Weirs and Notches: Rectangular, triangular, Cippolletti, sharp crested and broad crested weirs, submerged weirs	3	
3	Turbulent flow in circular pipes: Fluid friction in pipes, head loss due to friction. Darcy-Weisbach equation, Variation of friction factor with wall roughness – Moody's chart. Minor losses in pipes	5	
4	Water Hammer: Speed of pressure wave, slow and rapid closure, use of surge tank.	3	
5	Steady uniform flow in open channel: Characteristics, Chezy's, Manning's and Bazin's formulae. Hydraulically efficient cross sections. Flow through channels of circular cross sections – depths for maximum velocity and discharge.	5	
6	Varied flow through open channel: Gradually varied and rapidly varied flows. Definition, Specific Energy, Critical, Sub-critical and Super-critical flows. Channel transitions - constricted or raised bed. Establishment of critical flow, Venturi flume and Parshall flume. Definition and diagram for Specific force, Hydraulic Jump	10	
7	Dimensional Analysis and Model studies: Dimensions and dimensional homogeneity, Importance and use of dimensional analysis. Buckingham's Pi theorem with applications. Geometric, Kinematic and Dynamic similarity. Non Dimensional Numbers.	4	
8	Introduction to Hydraulic Turbines: Working Principles of Pelton, Francis and Kaplan turbines	3	
9	Pumps: Centrifugal pumps, performance characteristic graph – design flow rate. Working principles of positive displacement pumps, gear, reciprocating and vane pumps. Hydraulic Ram	5	

References

Sl. No	Name	Author	Publishers
1	Fluid Mechanics	Modi & Seth	Standard Book House, New Delhi
2	Fluid Mechanics	A.K.Jain	Khanna Publishers, New Delhi
3	Fluid Mechanics & Machinery	H. M. Raghunath	CBS Publishers, New Delhi
4	Fluid Mechanics and Fluid Machines	S. K. Som & G. Biswas	Tata McGraw Hill.
5	Fluid Mechanics, Hydraulics and Fluid Machines	S. Ramamrutham	Dhanpat Rai
6	Basic Fluid Mechanics	C. P. Kothandaraman & R. Rudramoorthy	New Age International
7	Open Channel Hydraulics	Van te Chow	McGraw Hill
8	Fluid Mechanics	John F. Douglas, Gasiorek & Swaffield,	Pearson Education
9	Introduction to Fluid Mechanics	Fox, Pritchard	
10	Fundamental of Fluid Mechanics	Munsen, Young	WIE

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STRUCTURAL ANALYSIS

Code: CE402

Contact: 3L + 1 T

Credits: 4

Sl. No	Details of Course Content	Hours	Total
1	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	4	42
2	Analysis of determinate structures: Portal frames, arches, cables	4	
3	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	4	
4	Deflection determinate structures: Moment area and Conjugate beam method, Energy methods, Unit load method for beams, Deflection of trusses and simple portal frames.	8	
6	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.	6	
6	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.	8	
7	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	8	

References

Sl. No	Name	Author	Publishers
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

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SOIL MECHANICS

Code:CE403

CONTACT-3L+1T

CREDITS-4

Sl. No	Details of Course Content	Hours	Total
1	Introduction: Origin & formation of Soil: Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy	2	42
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	
3	Identification & Classification of soil: Field identification of soil, Soil Classification: as per Unified Classification System, IS Code Recommendation, AASHTO Classification	4	
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	
5	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	
6	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	
7	Compaction of soil: Principles of Compaction, IS Light & Heavy Compaction Test, Field Compaction, Various methods of field compaction and control	4	
8	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	
9	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

Sl. No	Name	Author	Publishers
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

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Practical

Technical Report Writing & Language Lab Practice

Code: HU481

Cr-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*

I. 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

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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: 2L

Cr: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 Runge-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

Fluid Mechanics Lab

Code: CE491

Contact- 3P

Credits-2

1. Determination of Orifice co-efficient
2. Calibration of Orifice meter
3. Calibration of V- Notch
4. Measurement of velocity of water in an open channel using a pitot tube
5. Measurement of water surface profile for flow over Broad crested weir
6. Preparation of discharge rating curve for a sluice
7. Measurement of water surface profile for a hydraulic jump
8. Determination of efficiency of a Centrifugal pump
9. Determination of efficiency of a Reciprocating pump
10. Determination of efficiency of a Pelton wheel Turbine
11. Determination of efficiency of a Francis Turbine
12. Determination of efficiency of a Hydraulic Ram

Note: Students will have to study the Layout experimental units in the laboratory

Surveying Practice II

Code:CE492

Contact – 3 P

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

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Soil Mechanics Lab. – I

Code:CE493

Contact – 3 P

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 cohesionless 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 wiley)
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.