## Syllabus for B.Tech(Civil Engineering) Second Year

Revised & Proposed 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

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Field</th>
<th>Theory</th>
<th>Contact hours per week</th>
<th>Cr. Points</th>
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<tr>
<td>1</td>
<td>HU301</td>
<td>Values &amp; Ethics in Profession</td>
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<tr>
<td>2</td>
<td>PH301</td>
<td>Physics - 2</td>
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<tr>
<td>3</td>
<td>CH301</td>
<td>Basic Environmental Engineering &amp; Elementary Biology</td>
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<tr>
<td>4</td>
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<td>Solid Mechanics</td>
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<td>5</td>
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<td>Surveying</td>
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<tr>
<td>6</td>
<td>CE303</td>
<td>Building Material &amp; Construction</td>
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<td><strong>Total Theory</strong></td>
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<tr>
<th>Sl. No</th>
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<tr>
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### Second Year – Fourth Semester

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<td>M402</td>
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<td>4</td>
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<td>CE403</td>
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<td>Soil Mechanics Lab - I</td>
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<td><strong>Total of Semester</strong></td>
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<td><strong>26</strong></td>
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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.

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:


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
Module 2:
**Electricity**

2.1 Coulomb’s 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.

2.2 Dielectrics-concept of polarization, the relation \( D=\varepsilon_0 E+P \), Polarizability. Electronic polarization and polarization in monoatomic and polyatomic gases.

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.

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.

Module 5:
**Quantum Mechanics:**


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.

Module 6:

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

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

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,  

\[ L_{10} \text{ (18 hr Index)}, L_{d_n}. \]

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


Syllabus for B.Tech(Civil Engineering) Second Year

Revised & Proposed 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)

SOLID MECHANICS
Code: CE301
Contact: 3L
Credits: 3

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Details of Course Content</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Review of Basic Concepts of Stress and Strain:</strong> 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.</td>
<td>2</td>
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<td>2</td>
<td><strong>Beam Statics:</strong> 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</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td><strong>Symmetric Beam Bending:</strong> Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, Bending and shear stress for regular sections, shear centre</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td><strong>Deflection of statically determinate beams:</strong> Fundamental concepts: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions: Direct integration solution</td>
<td>6</td>
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<tr>
<td>5</td>
<td><strong>Analysis of determinate plane trusses:</strong> Concepts of redundancy, Analysis by method of joints, method of sections, graphical methods</td>
<td>4</td>
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<tr>
<td>6</td>
<td><strong>Two Dimensional Stress Problems:</strong> Principal stresses, maximum shear stresses, Mohr’s circle of stresses, construction of Mohr’s circle</td>
<td>6</td>
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<tr>
<td>7</td>
<td><strong>Introduction to thin cylindrical &amp; spherical shells:</strong> Hoop stress and meridional - stress and volumetric changes.</td>
<td>2</td>
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<td>8</td>
<td><strong>Torsion:</strong> Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical; springs</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td><strong>Columns:</strong> 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.</td>
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<tr>
<td>10</td>
<td><strong>Failure theories for homogeneous isotropic material:</strong> Von Misses criteria, Tresca’s criteria</td>
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References

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<tr>
<th>Sl. No</th>
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<tr>
<td>1</td>
<td>Elements of Strength of Material</td>
<td>S. P. Timoshenko &amp; D. H. Young</td>
<td>EWP Pvt. Ltd</td>
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<td>Engineering Mechanics of Solids</td>
<td>E. P. Popov</td>
<td>Pearson Education</td>
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<td>Strength of Materials</td>
<td>R. Subramaniam</td>
<td>OXFORD University Press</td>
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<td>Strength of Material</td>
<td>Bansal</td>
<td>Vikas Publishing House Pvt. Ltd</td>
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<td>S S Bhavikatti</td>
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<td>Strength of Material</td>
<td>A. Pytel &amp; F. L. Singer</td>
<td>AWL Inc</td>
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<td>Ramamrutham</td>
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<td>8</td>
<td>Engineering Mechanics I by</td>
<td>J. L. Mariam</td>
<td>John Willey</td>
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<thead>
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<th>Sl. No</th>
<th>Details of Course Content</th>
<th>Hours</th>
<th>Total</th>
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<tr>
<td>1</td>
<td><strong>Introduction:</strong> Definition, classification of surveying, objectives, principles of surveying</td>
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<td>2</td>
<td><strong>Chain surveying:</strong> 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</td>
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<tr>
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<td><strong>Compass Surveying:</strong> 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.</td>
<td>7</td>
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<td><strong>Plane Table Surveying:</strong> Equipment, Orientation, Methods of Plane Tabling, Three Point Problems.</td>
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<td>42</td>
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<tr>
<td>5</td>
<td><strong>Leveling:</strong> Introduction, Basic definitions, Detail of dummy Level, Temporary adjustment of Levels, Sensitiveness of bubble tube; Methods of leveling – Differential, Profile &amp; fly Leveling, Effect of curvature and refraction, Automatic levels, Plotting longitudinal sections and Cross sections; Measurement of area and volume</td>
<td>8</td>
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<tr>
<td>6</td>
<td><strong>Contouring:</strong> Topographic Map, Characteristics of Contour, Contour Interval. Methods of Locating Contours, Interpolation of Contours</td>
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<tr>
<td>7</td>
<td><strong>Theodolite Surveying:</strong> Components of a Transit Theodolite, Measurement of horizontal and vertical Angles, Co-ordinates and traverse Table</td>
<td>4</td>
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<tr>
<td>8</td>
<td><strong>Tacheometry:</strong> Definition, Details of stadia System, Determination of horizontal and vertical distance with Tacheometer- Staff held vertically and normal to the line of sight</td>
<td>2</td>
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<tr>
<td>9</td>
<td><strong>Simple Curves:</strong> Definition, Degree of Curve, Elements of Simple Curve, Setting out by Linear method and Rankine's tangential method.</td>
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**Introduction to Total Station with Field applications**

**References**

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<tr>
<td>1</td>
<td>Surveying:- Vol - I &amp; II</td>
<td>B.C. Punmia</td>
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<td>2</td>
<td>Surveying &amp; Leveling</td>
<td>R. Subramanian (OXFORD)</td>
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<td>Surveying:- Vol - I &amp; II</td>
<td>S.K. Duggal</td>
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<td>5</td>
<td>Fundamental of Engineering Survey</td>
<td>J.K. Ghosh (Studium Press, Roorkee)</td>
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<tr>
<td>6</td>
<td>Higher Surveying</td>
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<td>Surveying</td>
<td>Dr. A. M. Chandra</td>
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<td>9</td>
<td>Plane and Geodetic Surveying (Vol - I &amp; II)</td>
<td>R.B. Gupta &amp; B.K. Gupta</td>
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<td>10</td>
<td>Fundamental of Surveying</td>
<td>David Clark</td>
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<td>Surveying</td>
<td>S. K. Roy</td>
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<td>Saikia &amp; Das (PHI)</td>
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## BUILDING MATERIAL AND CONSTRUCTION

**Code:** CE303  
**Contact:** 3L + 1 T  
**Credits:** 4

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<td><strong>Material of Construction</strong></td>
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<tr>
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<td><strong>Bricks:</strong> 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.</td>
<td>3</td>
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<tr>
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<td><strong>Aggregates:</strong> Classification, Characteristics, Deleterious substances, Soundness, Alkali – aggregates reaction, Fine aggregates, Coarse aggregates, Testing of aggregates</td>
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<td><strong>Lime:</strong> Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling</td>
<td>2</td>
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</table>
| 4     | **Cement & Concrete:**  
| 4.1   | **Cement:** OPC: Composition, PPC, Slag cement, Hydration, setting time  
| 4.2   | **Concrete:** Types, ingredients, W/C ratio, Workability, Different grades in cement concrete, Tests on cement concrete | 5     |
| 5     | **Mortars:** Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars | 2     |
| 6     | **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 | 3     |
| 7     | **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 | 3     |
| 8     | **Miscellaneous Materials:** Gypsum: Classification, Plaster of Paris, Gypsum wall Plasters, Gypsum Plaster Boards, Adhesives, Heat and sound insulating materials, Geosynthetics | 2     |
|       | **Building Construction** | 42    |
| 9     | **Foundations:** Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations | 4     |
| 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 half brick thick wall) | 3     |
| 11    | **Wall, Doors and Windows:** Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal | 3     |
| 12    | **Stairs:** Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case | 3     |
| 13    | **Flooring:** Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing | 2     |
Syllabus for B.Tech(Civil Engineering) Second Year
Revised & Proposed 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)

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

15. **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

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name</th>
<th>Author</th>
<th>Publishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Building Materials</td>
<td>S.K. Duggal</td>
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<tr>
<td>2</td>
<td>2. Building Materials</td>
<td>P.C. Varghese</td>
<td>PHI</td>
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<tr>
<td>3</td>
<td>Engineering Materials</td>
<td>S.C. Rangwala</td>
<td></td>
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<tr>
<td>4</td>
<td>Concrete Technology</td>
<td>M. S. Shetty</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Concrete Technology/</td>
<td>A.M. Neville &amp; J.J. Brooks</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>6</td>
<td>Building Construction</td>
<td>B.C. Punnia</td>
<td></td>
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<tr>
<td>7</td>
<td>Building Construction and Foundation Engineering</td>
<td>Jha and Sinha</td>
<td></td>
</tr>
</tbody>
</table>

**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.
2. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
3. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
4. 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’g 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.

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.

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. 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)
Syllabus for B.Tech(Civil Engineering) Second Year
Revised & Proposed 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)

5. Haliday, Resnick and Crane (Physics vol.III)
6. Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography
2. A.J. Dekker
3. Aschroft and Mermin
4. Ali Omar
5. R.L. Singhal
6. Jak Tareen and Trn Kutry (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)

Physics II(PH 301)

Classical Mechanics (For Module 5.1 in PH 301)
H. Goldstein
A.K. Roychoudhuri
R.G. Takwal and P.S. Puranik
Rana and Joag
M. Speigel (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
Syllabus for B.Tech(Civil Engineering) Second Year

Revised & Proposed 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)


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: Brinell and Rockwell Tests
6. Test on closely coiled helical spring
7. Impact Test: Izod and Charpy

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
Syllabus for B.Tech(Civil Engineering) Second Year

Revised & Proposed 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)

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

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<thead>
<tr>
<th>Sl No.</th>
<th>Title</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Principles of Building Drawing</td>
<td>Shah &amp; Kale</td>
</tr>
<tr>
<td>2</td>
<td>Text Book of Building Construction</td>
<td>Sharma &amp; Kaul</td>
</tr>
<tr>
<td>3</td>
<td>Building Construction</td>
<td>B C Purnia</td>
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</tbody>
</table>

| Semester: IV  |

NUMERICAL METHODS
Code: M (CS) 401
Contacts: 2L
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, Weddle’s rule. (3)

Numerical solution of a system of linear equations:
Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Jacobi and Gauss-Seidel iterative methods. (6)

Numerical solution of Algebraic equation:
Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method. (4)


Text Books:

References:
2. Baburam: Numerical Methods, Pearson Education.
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 whole syllabus has been divided into five modules.

Note 2: Structure of the question paper

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the three modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have two or three parts covering not more than two modules. Sufficient questions should to be set covering the whole syllabus for alternatives.

Module I

**Fourier Series**

Introduction, Periodic functions, Even and odd functions, Special waveforms, Euler's formulae for Fourier coefficients, Dirichlet's conditions and sum of the Fourier series, Half range Fourier series, Parseval's identity (Statement only).

**Fourier Transform**:

Fourier Transform and its properties, Inverse Fourier Transform (Statement only), Fourier Transform of derivatives (Statement only), Convolution theorem (Statement only). Related problems. (8L)

Module II

**Calculus of Complex variable**:

Functions, Limit and Continuity, Analytic functions, Cauchy-Riemann equations

(Statement only) and related problems, Analytic continuation, Complex integration and Cauchy's theorem (Statement only), Cauchy's integral formula (Statement only), Taylors and Laurent series, Zeros of an analytic function, Poles, Essential singularities, Residue theorem (Statement only) and its application to evaluation of definite integrals (Elementary cases only), Introduction to Conformal Mapping. (12L)

Module III

**Probability**:
Axiomatic definition of probability, Conditional probability, Independent events, Related problems, Bayes theorem (Statement only) & its application. One dimensional random variable, Probability distributions-discrete and continuous, Expectation, Binomial, Poisson, Uniform, Exponential and Normal distribution, Problems on Binomial, Poisson and Normal distribution only. (12L)

Module IV

Partial Differential Equations:

Solution of one dimensional wave equation, One dimensional heat-conduction equation, Laplace equation in two dimension by the methods of

1: Separation of variables 2: Integral Transforms (Laplace and Fourier Transforms)

(6L)

Module V

Series solution of Ordinary Differential equation:

Introduction, validity of series solution of an ordinary differential equation, general method to solve equation of the type: \( p_0 y'' + p_1 y' + p_2 y = 0 \), related problems, Bessel’s equation, properties of Bessel’s function, Recurrence formula for Bessel’s function of first kind, Legendre’s equation, Legendre function; Recurrence formula for Legendre function \( P_n(x) \); Orthogonality relation. (10L)

Text Books:

2. Das N.G.: Statistical Methods, TMH.
5. Lipschutz S., and Lipson M.L.: Probability (Schaum’s Outline Series), TMH.

References:

5. Ramana B.V.: Higher Engineering Mathematics, TMH.

Fluid Mechanics

Code: CE 401
Contact: 3L
Credits: 3

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Details of Course Content</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fluid statics: Forces on plane and curved surfaces, Center of pressure. Stability of floating bodies, Metacentre.</td>
<td>4</td>
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<tr>
<td>2</td>
<td>Weirs and Notches: Rectangular, triangular, Cippoletti, sharp crested and broad crested weirs, submerged weirs</td>
<td>3</td>
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<tr>
<td>3</td>
<td>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</td>
<td>5</td>
</tr>
</tbody>
</table>
4 Water Hammer: Speed of pressure wave, slow and rapid closure, use of surge tank.

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.


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.

8 Introduction to Hydraulic Turbines: Working Principles of Pelton, Francis and Kaplan turbines

9 Pumps: Centrifugal pumps, performance characteristic graph – design flow rate. Working principles of positive displacement pumps, gear, reciprocating and vane pumps. Hydraulic Ram

References

<table>
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<th>Name</th>
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<th>Publishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fluid Mechanics</td>
<td>Modi &amp; Seth</td>
<td>Standard Book House, New Delhi</td>
</tr>
<tr>
<td>3</td>
<td>Fluid Mechanics &amp; Machinery</td>
<td>H. M. Raghnunath</td>
<td>CBS Publishers, New Delhi</td>
</tr>
<tr>
<td>5</td>
<td>Fluid Mechanics, Hydraulics and Fluid Machines</td>
<td>S. Ramanrutham</td>
<td>Dhanpat Rai</td>
</tr>
<tr>
<td>6</td>
<td>Basic Fluid Mechanics</td>
<td>C. P. Kothenadaraman &amp; R. Rudramoorthy</td>
<td>New Age International</td>
</tr>
<tr>
<td>7</td>
<td>Open Channel Hydraulics</td>
<td>Van te Chow</td>
<td>McGraw Hill</td>
</tr>
<tr>
<td>8</td>
<td>Fluid Mechanics</td>
<td>John F. Douglas, Gasirek &amp; Swaffield,</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>9</td>
<td>Introduction to Fluid Mechanics</td>
<td>Fox, Pritchand</td>
<td></td>
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<tr>
<td>10</td>
<td>Fundamental of Fluid Mechanics</td>
<td>Munsen, Young</td>
<td>WIE</td>
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STRUCTURAL ANALYSIS
Code: CE402
Contact: 3L + 1 T
Credits: 4

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<tr>
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<th>Details of Course Content</th>
<th>Hours</th>
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<tbody>
<tr>
<td>1</td>
<td>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</td>
<td>4</td>
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<td>2</td>
<td>Analysis of determinate structures: Portal frames, arches, cables</td>
<td>4</td>
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<tr>
<td>3</td>
<td>Strain energy: Due to axial load, bending and shear, Torsion; Castigiano's theorems, theorem of minimum potential energy, principle of virtual work, Maxwell’s theorem of reciprocal deflection, Betti’s law</td>
<td>4</td>
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<tr>
<td>4</td>
<td>Deflection determinate structures: Moment area and Conjugate beam method, Energy methods, Unit load method for beams, Deflection of trusses and simple portal frames.</td>
<td>8</td>
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</table>
### Syllabus for B.Tech(Civil Engineering) Second Year

Revised & Proposed 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)

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<tbody>
<tr>
<td>1</td>
<td><strong>Introduction:</strong> Origin &amp; formation of Soil: Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy</td>
<td>2</td>
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<tr>
<td>2</td>
<td><strong>Physical &amp; Index properties of soil:</strong> Weight- Volume Relationships, In-situ Density, Moisture Content, Specific Gravity, Relative Density, Atterberg’s Limits, Soil Indices, consistency of soil , Particle Size Distribution of soil: Sieving, Sedimentation Analysis</td>
<td>6</td>
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<tr>
<td>3</td>
<td><strong>Identification &amp; Classification of soil:</strong> Field identification of soil, Soil Classification: as per Unified Classification System, IS Code Recommendation, AASHTO Classification</td>
<td>4</td>
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<tr>
<td>4</td>
<td><strong>Flow through soil:</strong> 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</td>
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<tr>
<td>5</td>
<td><strong>Effective Stress Principles:</strong> Effective Stress, Effective pressure due to different conditions, Seepage force, Critical hydraulic gradient, Quick sand condition, Design of filters, Capillarity in soil</td>
<td>4</td>
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</table>
Syllabus for B.Tech(Civil Engineering) Second Year

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<tr>
<td>6</td>
<td>Stress Distribution In Soil: Normal and shear stresses, Stress due to point loads, Stress beneath Line, strip &amp; uniformly loaded circular area &amp; rectangular area, pressure bulbs, Newmark’s charts- Use for determination of stress due to arbitrarily loaded areas</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Compaction of soil: Principles of Compaction, IS Light &amp; Heavy Compaction Test, Field Compaction, Various methods of field compaction and control</td>
<td>4</td>
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<tr>
<td>8</td>
<td>Compressibility &amp; Consolidation of Soil: Terzaghi’s theory of one dimensional consolidation, Compressibility characteristics of soils: Compression index, Coefficient of compressibility &amp; volume change, Coefficient of consolidation, Degree &amp; rate of consolidation, Laboratory method of one dimensional consolidation test, Determination of consolidation parameters, Secondary consolidation</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>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 &amp; thixotropy of clay.</td>
<td>6</td>
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References

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</tr>
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<tbody>
<tr>
<td>1</td>
<td>Principles of Geotechnical Engineering</td>
<td>B. M. Das</td>
<td>Thomson Book Store</td>
</tr>
<tr>
<td>2</td>
<td>Text book of Soil Mechanics &amp; Foundation Engineering</td>
<td>V.N.S. Murthy</td>
<td>CBS Publisher’s &amp; distributors</td>
</tr>
<tr>
<td>3</td>
<td>Geotechnical Engineering – Principles and Practice</td>
<td>Coduto</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>4</td>
<td>Soil Mechanics</td>
<td>Lambe &amp; Whitman.</td>
<td>WIE</td>
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Practical

Communication Skill & Report Writing
Code: HU491
Cr-2
(To be implemented)

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.
4. Assignments on numerical solution of Algebraic Equation by Bisection, Secant, Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Taylor series, Euler’s, Runge-Kutta and Finite difference 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

**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).
Syllabus for B.Tech(Civil Engineering) Second Year

Revised & Proposed 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)

6. Determination of co-efficient of permeability by constant head permeameter (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