## Course Code: BCEL – 302

## Course Name: Surveying - II

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

**Course Objectives:**

1) To understand the working of theodolite.
2) To understand the determination of heights & distances by tacheometry.
3) To understand various types of curves used in practice.
4) To provide knowledge on setting out civil engineering works & detailed field surveying.
5) To understand the concepts of hydrographic & photographic surveying.

**Syllabus:**

**Unit-I**

Traversing by theodolite, Fieldwork checks, traverse computations, latitude and departures, computations of co-ordinates, plotting & adjustment of traverse. Omitted measurements. Trigonometrical levelling, precise levelling.

**Unit II: Tacheometry**

Tacheometric systems and principles, stadia system, uses of anallactic lens, tangential system, substance system, instrument constant, field work reduction, direct reading tacheometers, use of tacheometry, accuracy.

**Unit III: Curves:**

Classification and use, elements of circular curves, setting out curves by offsets and by theodolites, obstacles and special problems, compound curves, reverse curves, transition curves, cubic spiral and lemineiscate, vertical curves, computation and setting out.

**Unit IV: Control Surveys**

Providing frame work of control points, triangulation principle, forms of framework, reconnaissance survey, selection and making of stations, Control line, baseline measurement & corrections, flexible apparatus and corrections, computation of sides, precise traversing,

**Unit V: Hydrographic Surveying & Photographic Surveying:**

Soundings, methods of observations, computations and plotting, Principles of photographic surveying – aerial photography, tilt and height distortions, uses.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Develop the skills of using theodolite in the construction survey.
2) Develop the skill of curve setting & setting out of works.
3) Prepare contour maps in digital form using the Total Station & GPS data.
4) Make alignment of roads, canal, railway line & other civil engineering works.
5) Work as surveyor for land and revenue related works.

6) Understand the concepts of hydrographic & photographic surveying.

**Books Recommended:**


i) R.E. Devise, Surveying theory & Practice, Mc Graw Hill, New York

ii) David Clark & J Clendinning, Plane & Geodetic surveying Vol. I & II, Constable & C. London.

iii) S.K. Roy, Fundamentals of surveying, Prentice – Hall of India New Delhi

iv) B.C. Punmia, Surveying Vol. I, II, III, Laxmi Publications New Delhi

v) K.R. Arora, Surveying Vol. I & II, Standard book House, New Delhi


**List of Experiments:**

1. Measurement of horizontal and vertical angle by Vernier Theodolite.
2. Theodolite traversing.
3. Determination of R.L. of a point whose base is accessible by Trigonometrical levelling.
4. Determination of R.L. of a point whose base is inaccessible by Trigonometrical levelling.
5. Determination of tachometric contents in field.
6. Determination of height & distance by using Tangential tachometry
7. Determination of height & distance by Stadia method of tachometry.
8. Measurement of base line by using Substance Bar.
9. Setting out of a simple circular curve by using Rankine's method.
10. Setting out of a simple circular curve by using Offset from the chord produced or deflection distance.
11. Determination of horizontal & Vertical position of a point by Total Station.
12. Traversing by Total Station.

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## Course Code: BCEL – 303

## Course Name: Transportation Engineering - I

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

**Course Objectives:**

1) To understand the planning aspects of roads & highways.

2) To understand the geometric aspects of roads & highways.

3) To know the design aspects of various layers and components of pavement.

4) To understand the construction process and methods of roads & highways.

5) To understand the requirements of airport, runway & taxiway.

6) To understand the requirements of lighting & signal & traffic control at airports.

**Syllabus:**

**Unit – I Highway planning, Alignment & Geometric Design:**

Principles of highway planning, road planning in India and financing of roads. Surveys for highway location. Cross sectional elements-width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves. Important I.R.C. specification.

**Unit – II Bituminous & Cement Concrete Pavements:**

Design of flexible pavements, design of mixes and stability, surface dressing, interfacial treatment – seal coat, tack coat, prime coat, wearing coat, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints. Brief study of recent developments in cement concrete pavement design, Fatigue and reliability.

**Unit – III Highway Construction, Stabilization, Drainage of Roads, Traffic Engg. & Transportation Planning:**

Principles of stabilization, mechanical stabilization, advantages, disadvantages and uses. Macadam roads-types, specifications, construction, maintenance and causes of failures. Surface and sub-surface drainage, highway materials-properties and testing etc. Channelized and unchannelised intersections at grade and grade separated intersection description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip distribution, model split traffic assignment, plan preparation and elevation.

**Unit – IV Airport Planning, Runway, & Taxiway:**

Airport site selection air craft characteristic and their effects on runways alignments, wind rose diagrams, basic runway length and corrections, classification of airports. Geometrical elements taxi ways and runways, pattern of runway.

**Unit – V Airport Obstructions, Lighting & Traffic Control:**

Zoning regulations, approach area, approach surface-imaginary, conical, horizontal and transitional surfaces Rotating beacon boundary lights, approach lights, runway and taxiway highway lighting etc. instrumental landing system, precision approach radar, VOR enroute traffic control.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Select the best alignment out of various alternatives.
2) Calculate the sight distance required for the safe movement and overtaking.
3) Decide the geometrical aspects of Highway and Permanent way.
4) Know the design & construction of Road pavements.
5) Understand various types of traffic regulatory mechanism i.e. signal rotaries etc.
6) Enable to run operate & maintain air port runway & taxiway and to control air traffic.

**Books Recommended:**


i) Highway Engineering by Gurucharan Singh
ii) Principles of Pavement Design by E.J. Yoder & M.W. Witzech
iii) Highway Engineering by S.K. Khanna & C.E.G. Justo
iv) Airport Planning & Design by S.K. Khanna & M.G. Arora
v) Foresch, Charles "Airport Planning"
vi) Horonjeff Robert "The Planning & Design of Airports"
vii) Sharma & Sharma, Principles of Practice of Highway Engg.
viii) Teng, Functional Design of Pavements
ix) Principle & practices of Highway Engineering by L.R. Kadiyali
x) Traffic Engineering & Transportation Planning by L.R. Kadiyali


**List of Experiments:**

1. Aggregate Crushing Value Test
2. Determination of Aggregate Impact Value
3. Determination of Los Angeles Abrasion Value
4. Determination of flakiness index and elongation index of aggregates.
5. Determination of California Bearing Ratio Value
6. Determination of Penetration Value of Bitumen
7. Determination of Viscosity of Bituminous Material
8. Determination of Softening Point of Bituminous Material
9. Determination of Ductility of the Bitumen
10. Determination of Flash Point and Fire Point of Bituminous Material
11. Determination of Bitumen Content by Centrifuge Extractor
12. Determination of Stripping Value of Road Aggregate
13. Determination of Marshall Stability Value for Bitumen

## Course Code: BCEL – 304

## Course Name: Concrete Technology

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

**Course Objectives:**

1) To study the properties of concrete ingredients i.e. cement. Sand and Coarse aggregate by conducting different tests.

2) To conduct the field and laboratory tests on concrete in plastic and hardened state.

3) To design economic mix proportion for different exposure conditions and intended purposes as per relevant IS Codes.

4) To select of different types of admixtures to improve the properties of concrete for different field applications.

5) To estimate strength of existing RCC structures using NDT.

**Syllabus:**

**Unit-I Ingredients of Concrete:**

**Portland Cement:** Chemical composition of cement, Hydration of cement, setting of cement, tests on physical properties of cement Fineness.

**Cement:** Types of Portland cement – Ordinary Portland cement – Rapid Hardening Portland cement – low heat Portland cement- Sulphate Resisting cement – Portland Blast furnace cement- Super Sulphated cement- Portland Pozzolana cements and Pozzolanas: Fly ash; use of pozzolanas, white cement, Expansive cements – High alumina cement.

**Aggregates:** General classification of aggregates, natural and artificial aggregates, particle shape and texture, bond of aggregate, strength of aggregate, Mechanical properties of aggregate, specific gravity, Bulk density, porosity and absorption of aggregate, moisture content of aggregate, Bulking of sand deleterious substances in aggregates, organic impurities. Soundness of aggregates, Alkali-aggregate reaction, Alkali carbonate reaction, sieve analysis – Grading curves, Fineness modulus, Grading requirements, Grading of fine and coarse aggregates and Gap graded aggregates. Thermal properties of aggregates.

**Admixtures:** Introduction, functions of admixtures, classification of admixtures, Accelerators, Retarders, Water Reducing Agents, Super plasticisers.

**Unit-II Fresh and Hardened Concrete:**

**Fresh Concrete:** Workability of concrete, factors affecting workability, measurement of workability using slump test, Compaction factor test, Flow test, Vee-Bee Test, Ball penetration test, Nasser's °K- probe test, Segregation and Bleeding of concrete, Mixing of concrete, Vibration of concrete, Different types of mixers and vibrators. Concreting in Hot weather and Cold weather.

**Hardened Concrete:** Compressive & Flexural strength of concrete, Stress and strain characteristics of concrete, drying shrinkage of concrete, Creep of concrete, Permeability and durability of concrete, Fire resistance of concrete, Thermal properties of concrete. Micro-cracking of concrete, methods of curing, Influence of temperature on strength, Fatigue & Impact strength of concrete.

**Unit-III Testing & Quality Control of Concrete:** (a) Compression tests-cube test, Cylinder test, effect of end conditions on specimen and capping. Flexure test, splitting test, influence of size of

specimen on strength, rebound hammer test, penetration resistance test, Pull-out-test, ultrasonic pulse velocity test.

(b) Field control for Quality of Concrete, Advantages of Quality Control, Statistical quality control, Measure of variability & its applications, Quality management in concrete construction.

**Unit-IV**

**Concrete Mix Design:** Basic considerations, factors in the choice of mix proportions, design of standard concrete mixes by IS code methods, design for strength in flexure.

**Equipments for concrete production:** Different types of crushers, Screens, Batchers, mixers, vibrators, Belt conveyors, Concrete pumps, modern equipments, formworks, shuttering.

**Unit-V**

**Special Concretes:** High strength concrete, High performance concrete, Fibre reinforced concrete, Ready mixed concrete, Pumped concrete, Polymer concrete, Concrete for code climate, mass concreting composites, Sulphur infiltrated concrete, Ferro cement, Light weight concrete, High density concrete, Cellular foam concrete, recent advances in concrete manufacturing.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Test the ingredients of concrete as per IS code. \

2) Design concrete mix of different grades.

3) Determine properties of fresh concrete.

4) Determine properties of hardened concrete.

5) Select suitable types of admixtures to improve the properties of concrete for different field applications.

6) Carry out inspection & measurement of strength of old RCC Structure.

**Books Recommended:**


i) Neville M. Properties of Concrete, ELBS

ii) Shetty, Concrete Technology

iii) Gambhir, Concrete Technology

iv) Varshney, Concrete Technology

v) Nawy E.G., Concrete Construction Engineering Hand Book

vi) D.F. Orchard, Concrete Technology

vii) F.M. Lue, "Chemistry of Cement & Concrete".


**List of Experiments:**

1. Determination of properties of cement, sand & aggregate.
2. Determination of workability of concrete by slump test.
3. Determination of workability of concrete by compacting factor apparatus.
4. Determination of workability by Vee Bee consistometer.
5. Non destructive testing of concrete by Rebound Hammer Test.
6. Test for the effect of admixtures on the concrete compressive strength.

(36)

## Course Code: BCEL – 305

## Course Name: Building Design Drawing & Town Planning

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To prepare students with the knowledge and understanding of Details of various building components.
2) To make students understand different types of flooring, materials of floor finishes and method of construction.
3) To facilitate students learn different types of stairs and roof systems.
4) To expose students to the building services and cost – effective construction.
5) To expose students regarding building bye-laws, rules & regulation of Building plans.
6) To make student understand salient principles of planning & architectural composition.

**Syllabus:**

**Unit-1 Drawings of Building elements**

Free-hand drawings of various building elements like, Various types of footings, Open foundations, grillage, pile , R.C.C. and Well foundations, Drawing & detailing of reinforcement in Building components, Drawings of door-Window frames, Various types of doors windows and ventilators, Lintels and Arches, Stairs and stair cases, Trusses, Floorings, Roofing, etc.

**Unit-2 Building Planning**

Provision of NBC, Building by-laws, Rules and regulations, Open area, Setbacks. F.A.R. Terminology, Principle of Architectural Composition (i.e. Unity, contrast, symmetry, Rhythm, Mass composition. etc.), Principles of planning, Orientation, Rules & Regulation of town & country planning.

**Unit-3 Drawings of Buildings**

Detailed drawings using Auto Cad Software (2D & 3D Plan, Front elevation, Side elevations, Sectional elevations ) of Residential building, Institutional building and Commercial building, Detailing of doors, windows, ventilators, stairs etc. (School building, commercial complexes, Rest house / guest house, Health Centers, Institutional building, Residential building.

**Unit-4 Town Planning**

History & development of cities & towns, Types of towns & cities i.e. Ribbon development, Satellite town, Centralized, Garden city etc, Problems of metro cities, case stagy – Chandigarh, Gandhinagar Pondicherry etc., planning of cities & amenities, smart city concept, Integrated facilities requirement for smart cities.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Identify and decide upon the usage of different building materials in practice.
2) Select suitable types of floorings and flooring materials.

3) Decide upon the types of stairs and roofs for different types of buildings based on their usage.

4) Have exposure to the different services for buildings and also about the different cost effective construction techniques.

5) Draw working drawings of various components of building.

6) Make workable planning & draw workable drawing of various types of buildings.

7) To execute work at site in accordance to Drawing.

**Books Recommended:**

- Building Design and Drawing by Mallick and Mao
- Building Drawing and Design by Sah, Kale and Pathi
- Building Design and Drawing by Gurucharan Singh
- Building Design and drawing by Y.S.Sane
- N.B.C( Latest Edition).
- Auto cad Software & Manual.

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## Course Code: BCEP–306

## Course Name: Civil Engineering Drawing Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objectives:**

1) To draw plan, elevation & section of various components of a building.
2) To prepare sketches of various components of building like doors, windows etc.
3) To expose students to use software's like Auto cad in civil engineering drawing.

**Syllabus: List of Practical's:**

1. One drawing sheet containing Doors, Windows, Ventilators, Lintels, and Arches etc. using Auto cad
2. One drawing sheet containing Stairs, Foundations, and Trusses using Auto cad
3. One drawing sheet containing detailed planning of one/two room residential building (Common to all students)
4. Drawing sheets one each of residential and Institutional building using Auto cad
5. Sketches of various building components

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Draw plan, elevation & section of various components of a residential & institutional building.
2) Use software in civil engineering drawing.
3) Develop the skills of a professional planner.

## Course Code: BCEL – 401

## Course Name: Quantity Surveying & Costing

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To work out the quantities of various items of civil works like buildings, culverts including steel girders etc.

2) To compute earthwork.

3) To understand detailed specifications and carry out analysis of rates.

4) To understand various methods of carrying out estimation.

5) To understand valuation process for fixing rent, depreciation etc.

6) To understand how to use computer in estimation & valuation.

**Syllabus:**

**Unit I**

**Introduction**

Purpose and importance of estimates, principles of estimating, methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet, bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

**Unit II**

a) **Specifications of materials and works.**

b) **Rate Analysis:** Task for average artisan, various factors involved in the rate of item, material and labour requirement for various trades, preparation for rates of important items of work, current schedule of rates (C.S.R)

**Unit III**

**Estimates**

Use of MS Excel spread sheet for estimation, preparing detailed estimates of various types of buildings, Long wall, Short wall & Center line method R.C.C Works, earth work calculations for roads and estimating of culverts, services for building such as water supply, drainage and electrification.

**Unit IV**

**Cost of Works**

Factors affecting cost of work, overhead charges, contingencies and work charge establishment, various percentages for different services in building. Development of Computer programmes for estimation & costing.

**Unit –V**

**Valuation**

Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate of interest, methods of valuation, rent fixation of buildings.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Prepare estimate of buildings, manhole, septic tanks, truss etc.

2) Compute earthwork.

3) Interpret specifications and work out rates.

4) Follow Departmental procedures.

5) Prepare tender specification etc.

6) Value the properties fixation of rate.

**Books Recommended:**


i) Quantity Surveying & costing – B.N. Dutta

ii) Estimating & Costing for Civil Engg. – G.S. Birdi

iii) Quantity Surveying & Costing – Chakrobarthy

iv) Estimating & Costing – S.C. Rangwala


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## Course Code: BCEL – 402

## Course Name: Fluid Mechanics - I

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

**Course Objectives:**

1) To understand fluid properties and concept of fluid continuum.

2) To understand the concepts of kinematics & dynamics of fluid flow.

3) To apply fluid flow principles to various fluid flow problems.

4) To understand the mechanism of fluid measurement.

5) To understand the method of simulation & dimensional analysis.

6) To understand the concepts of laminar flow.

**Syllabus:**

**Unit I**

**Review of Fluid Properties**

Engineering units of measurement, density, specific weight, specific volume, specific gravity, surface tension, capillary, viscosity, bulk modulus of elasticity, pressure and vapour pressure.

**Fluid Statics**

Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems – gravity dams and Tainter gates), buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

**Unit II**

**Kinematics of Flow**

Types of flow-ideal & real, steady and unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streamlines, streamlines and stream tubes, continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flownets-their utility & method of drawing flownets.

**Unit III**

**Dynamics of Flow**

Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum equation, forces of fixed and moving vanes and other applications.

**Fluid Measurements**

Velocity measurement, flow measurement (Orifices, nozzles, mouth pieces, orifice meter, Nozzle meter, venturimeter, weirs and notches).

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**Unit IV**

**Dimensional Analysis and Hydraulic Similitude**

Dimensional analysis, dimensional homogeneity, use of Buckingham-pie theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, etc.)

**Unit V**

**Laminar Flow**

Introduction to laminar, transition & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, stokes law, Bach wash processing, Instability of laminar flow to turbulent flow.

## Course Outcomes:

Upon completion of the course, the students will be able to:

1) Understand relationship among various fluid properties.
2) Analyze problems of static fluid.
3) Analyze problems of fluid in motion.
4) Apply governing principles and equations to different fluid flow problems in open channel.
5) Measure & estimate discharge in steams / channels.
6) Prepare model for testing & analysis of prototype.
7) Apply the concepts of laminar flow in solving various fluid flow problems.

## Books Recommended:


i) Fluid Mechanics by Modi & Seth – Standard Book House, Delhi
ii) Fluid Mechanics by A.K. Jain – Khanna Publishers, Delhi
iii) Fluid Mechanics by Streeter – Mc Graw Hill
iv) Fluid mechanics by Girde & Mirazgaonkar – SCI Tech Publishers
v) Fluid Mechanics by R.K. Bansal – Laxmi Publishers


## List of Experiments:

1. Calibration of Venturimeter
2. Determination of Cc, Cd, Cv of Circular Orifice
3. Calibration of Mouth Piece
4. Calibration of Orifice Meter
5. Reynolds experiment for demonstration of stream lined & turbulent flow
6. Determination of Friction Factor for a pipe
7. Verification of Stoke's law.

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## Course Code: BCEL – 403

## Course Name: Environmental Engineering - I

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

### Course Objectives:

1) To understand the structure of drinking water supply systems, including water transport, treatment and distribution.

2) To make the students conversant with sources and its demand of water and calculate water quantity.

3) To determine various water quality characteristics, understand their significance & compare with existing water quality criteria and standards.

4) To expose students to understand the operation and maintenance of water supply system components including the design of pipelines and other components.

5) To provide adequate knowledge about the water treatment processes and its design.

### Syllabus:

**Unit- I** Water demand (types variation, factors affecting ), Design period, population forecasting methods, underground water quality & quantity, Pumping test, recuperation test, Tube wells (Types, development) yield of tube well, theims-formula, dupits formula, interference amongst well.

**Unit- II** Intake structures ( location, types ) conduits for transporting water, forces on conduits, types of pressure pipe, joints, corrosion of pipe (causes & control), pipe appurtenances, pumping of water, pumps character, types of pumps , Economical diameter of rising main, characteristics of water (laboratory method & effects) , water born diseases, standards for drinking water.

**Unit- III** Water treatment flow diagram, design, construction, working of (Aerators, screens, plain sedimentation tank, tube settlers), coagulants & coagulation, flocculation, feeding and mixing of coagulants, optimum dose of coagulants, design & working of clarrifloculator, filtration (Theory & types), Design, operation & construction of slow sands & Rapid sand gravity filters, pressure filters.

**Unit- IV** Disinfectants (types) & disinfection method of disinfection, chlorine & chlorine compounds, types of chlorination, Hardness (Causes & types), various methods of softening, Recarbonation, calculation of chemical requirements, Removal of colour, odour, Taste, Iron & manganese, algae removal, fluoridation /de fluoridation, desalination.

**Unit- V** Requirement of good distribution system, layout of distribution, methods of distribution, Distribution reservoir and calculation of its capacity, fixing size of pipe, Analysis of pipe networks (Hardy cross method, Equivalent pipe method), appurtenances used in distribution networks, water supply & plumping system in building, Rural water supply.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) List and describe the major physical chemical and biological characteristics of water.
2) Quantify the water requirement for various uses.
3) Design treatment unit for various parameter in water.

4) Prepare an outlay of safe distribution of water.

5) Estimate quantity of chemicals required in treatment units.

6) Run maintain water supply scheme & water treatment plant.

**Books Recommended:**


i) Water Supply & Sanitary Engg. – G.S. Birdie – Dhanpat Rai Publishing Company, (P) Ltd. New Delhi

ii) Water Supply Engg. By B.C Punmia – Laxmi Publication (P) Ltd. New Delhi

iii) Environmental Engg. – I –S. K. Garg – Khanna Publishers New Delhi.

iv) Water & Waste Water Technology – Mark J Hammer – Prentice – Hall of India, New Delhi


**List of Experiments:**

1) Sampling Techniques for collection of water samples

2) Determination of pH value

3) Determination of acidly

4) Determination of alkalinity

5) Determination of Hardness (Total & permanent)

6) Determination of chlorides

7) Determination of sulphate

8) Determination of T.S., DS & SS

9) Determination of optimum dose of coagulants

10) Determination of Dissolved oxygen

## Course Code: BCEL – 404

## Course Name: Building Materials & Construction

| L | T | P | Credit |
|---|---|---|---|
| 2 | 1 | 2 | 4 |

**Course Objectives:**

1. To provide broad knowledge of manufacturing & testing methods of common building materials i.e. brick, stone etc.
2. To provide knowledge about various types & production of mortars and their application.
3. To understand the processing, selection, preservation of seasoning of timber.
4. To provide knowledge about selection & specification of ferrous & non ferrous material (construction material).
5. To provide knowledge on soil investigation, bearing capacity and its improvement and design of foundation, including selection of appropriate foundation.
6. To understand laying & construction of brick & stone masonry and various methods of damp proofing etc.
7. To provide knowledge about location & design of stair in various types of buildings.

**Syllabus:**

**Unit I**

Basic physical & mechanical properties of materials, Bricks (classification, characteristics, preparation of clay, manufacturing, testing, types), stones (classification, Quarrying, seasoning characteristics, testing, selection & uses, application, preservation)

**Unit II**

Wood & Timber, (Classification, Structure & characteristics, seasoning and its methods, defects & diseases, preservation & various treatment testing), wood products and their applications, cement and its chemical composition (Raw material, hydration, manufacturing process, testing, types of cement, storage & admixtures)

**Unit III**

Mortar (Classification, characteristics, functions of ingredients). Types of mortar and their uses grout, guniting, ferrous material (Pig iron, CI, Mild steel, wrought Iron stainless steel, compositions & proposition). Reinforced steel bars (classification, types, designation) Aluminium (its alloys & uses). Copper (its alloys & uses), Ceramics (classification, properties, commercial forms), Paint varnishes & enamels (types, composition, method of application, defects)

**Unit IV**

Soil (their investigation & testing). Bearing capacity (types, determination, and improvement methods). Foundation (its importance types & classification, pile foundation), Foundation design. Masonry construction, masonry classification, stone V/s brick masonry, Terms & Definition in stone & brick masonry, joints in stone masonry, dressing of stone. Brick masonry (bonds in brick masonry, characteristics of bonds, type of bonds), typical structures in brickwork, RBC

**Unit V**

Damp prevention (causes, effects, control & prevention techniques, material used for damp proofing), Anti termite treatment, water proofing treatment, Arches & lintels, stair & stair case, (types & design of stair case), Types of floor & flooring, Roof & roof covering.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1. Select suitable building material for construction.
2. Manage quality control of the construction of civil structures.
3. Perform field test & laboratory test on common materials.
4. Select suitable foundation on different type of soils to prevent defects in buildings.
5. Design & plan stair in Residential & commercial building.
6. Monitor construction & progress of quality construction.

**Books Recommended:**


1. Building materials By :- Mr. M.L. Gambhir, Tata Mc-graw Hil education Pvt. Ltd.
2. Building material By :-Mr. S.K. Duggal, New Age Publishers
3. Building construction By :- Mr. S.P.Arora, Bindra, Dhanpat Rai & Sons
4. Building construction By:- Mr. B.C. Punmia, A.K.Jain, Laxmi Publishers New Delhi
5. Building material By:-Mr. B.C. Punmia, Laxmi Publishers New Delhi


**List of Experiments:**

1. Water absorption & efflorescence of brick
2. Physical measurement of brick & tolerances (Dimension test)
3. Field testing on bricks
4. Crushing strength of bricks
5. Attrition/Impact
6. S.G. of stone
7. Determination of compressive strength of stone
8. Durability of stone
9. Static bending strength of Timber

## Course Code: BCEL – 405

## Course Name: Strength of Materials

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To understand the concepts of simple and compound stresses and strains.
2) To understand the behaviour of elastic materials in bending, shear and torsion.
3) To understand the stability behaviour of long columns under axial load.
4) To understand the power transmission by shift.
5) To understand stresses & strain developed in storage vessels
6) To calculate stresses / strain in statically in determination structures.

**Syllabus:**

**Unit-I**

**Stress and Strains**

Concept of Elastic body, stress and strain. Hooke's law various types of stress and strains. Elastic constants and their relation Stresses in compound bars, composite and tapering bars, temperature stresses.

Two-dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains. Mohr's circle of stresses. Strain energy and theories of failure.

**Unit - II**

**Theory of simple bending**

Concept of pure bending and bending stress, equation of bending, Neutral axis, Section-Modulus, Bending stress distribution across a section, Shear Stresses in Beams, beams of uniform strength.

**Unit-III**

**Torsion of Shafts**

Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow circular shafts. Combined bending and torsion. Open and closed springs, leaf spring and spiral spring.

**Pressure Vessels**

Thin cylinders and spheres. Stress due to internal pressure. Change in diameter and volumes.

**Unit-IV**

**Columns and Struts**

Euler's buckling load for uniform section, various end conditions. Slenderness Ratio. Merchant Ranking formulae, Eccentric loading on columns.

**Unit-V**

Deflection of statically determinate structure by Geometrical methods & Introduction of method of virtual work.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Analyze simple and compound stresses and strains.
2) Evaluate the stresses in bending shear and torsion
3) Analyze load withstand capacity of long column.
4) Analyze the stresses in thick and thin cylinders, compound cylinders.
5) Gain knowledge of analysis of statically indeterminate structure which is essential for its design.
6) Understand the behaviour of various types of structure under different types of forces & pressure.

**Books Recommended:**

i) Strength of Materials by Timoshenko
ii) Strength of Materials by Higdon Style
iii) Strength of Materials by Sadhu Sigh
iv) Strength of Materials by R. K. Bansal
v) Strength of Materials Vol. I & II by B.C. Punmia

## Course Code: BCEP– 406

## Course Name: Material Testing Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objectives:**

1) To carry out various tests to determine the strength & understand the nature of materials under different loading conditions.

**Syllabus: List of Practical's:**

1. Impact Test
2. Brinell Hardness Test
3. Behaviour of columns with Different End Conditions
4. Tensile test
5. Compression test
6. Flexure test
7. Shear test

Experiments by each student shall be recorded in his practical book & method for assessment.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Carry out impact test, hardness test, tensile test etc.
2) Understand the behaviour of different materials under various loading conditions.

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## Course Code: BCES – 407

## Course Name: Idea Generation

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objectives:**

1) To encourage students to read, study & understand different topics of civil engineering published in articles, literatures.

2) To help in presenting different topics of civil engineering and related subjects to supplement theoretical knowledge gained in class.

3) To make student acquire good oral & written communication skills.

4) To promote the habit of lifelong learning.

5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

**Syllabus:**

1. Any relevant topic related to civil engineering from within or beyond the syllabus.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Analyze & interpret about contemporary issues in civil engineering & its allied areas through literature survey.

2) Know about state of art & relevance of the topic in national & international arena.

3) Demonstrate good oral & written communication skills.

4) Comprehend problems and accordingly speak and defend their topic.

5) Produce poster and power point presentations for effective communication amongst stakeholders.

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## Course Code: CEL – 701

## Course Name: Construction Planning & Management

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

### Course Objectives:

1) To make student conversant with the concepts and importance of the subject of construction planning & management.

2) To provide a broad knowledge on how to make bar chart, work break structure of a project, schedules.

3) To provide a broad knowledge on how to analyze a problem using various techniques of project management like CPM, PERT & optimization of time & cost of a project.

4) To provide knowledge on how to prepare a tender document, contract & arbitration for a project.

5) To provide an insight into various types of machinery used in construction works & various concepts of man & material management.

### Syllabus:

**Unit-I Introduction:**
Form work and centering. Schedule of construction, job layout, principles of construction management.

**Unit-II Modern management techniques:**
An overview of planning process, Planning through Bar Charts and Milestone charts, Network techniques, Basic concept of network preparations, CPM and PERT techniques with network anlaysis.

**Unit-III Construction equipments:**

Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earthwork, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting. Equipment Management.

**Unit-IV Contracts:**

Different types of contracts, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, breach of contract. Escalation & price variation.

**Unit-V Cost Analysis & Site Organization :**
Project cost direct and indirect, cost curves, optimum duration, contracting the network for cost optimization, Time cost optimization, labour laws and human relations, welfare facilities, safety engineering.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Understand the responsibilities & roles of a project manager.

2) Prepare schedule of activities including bar charts.

3) Analyze various problems of time & cost optimization using network techniques like CPM & PERT.

4) Develop a management system, incorporating constraints of time and cost, social, legal and ethical aspect of various phases of project life cycle.

5) Prepare tender & contract document for a construction project.

6) Plan and manage effectively for man, material & equipment of a project along with suitable safety measures.

**Reference Books:**

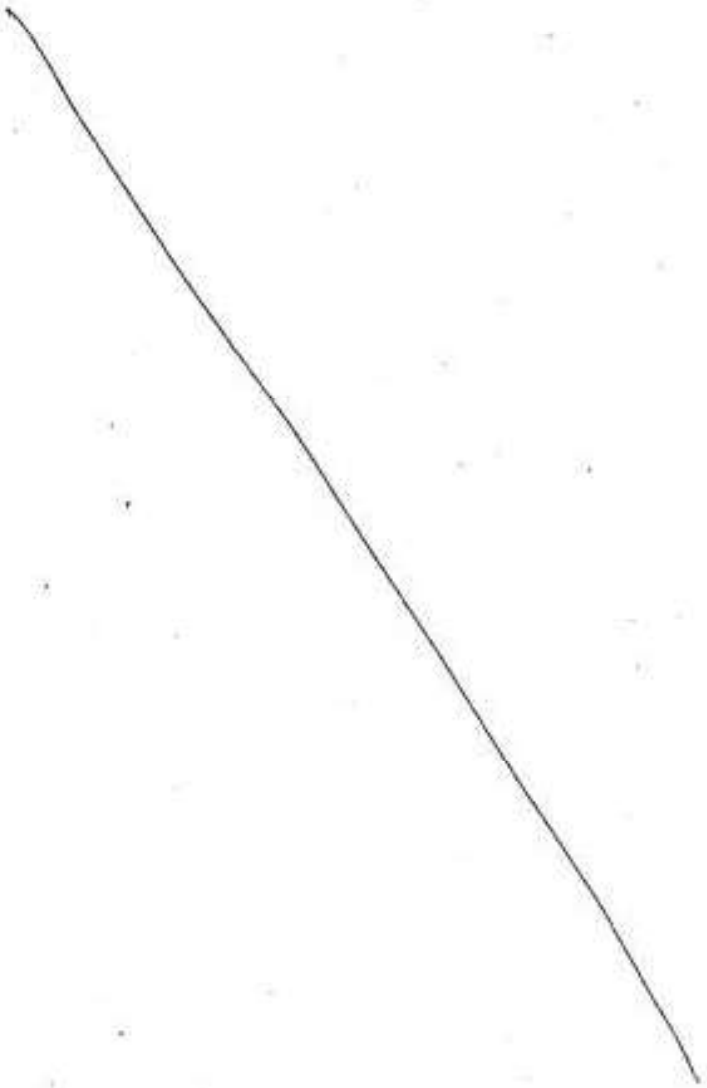

i) Construction Equipment by Peurify

ii) CPM by L.S. Srinath

iii) Construction Management by S. Seetharaman

iv) CPM & PERT by Weist & Levy

v) Construction, Management & Accounts by Harpal Singh

## Course Code: CEL – 702

## Course Name: Environmental Engineering - II

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 6 |

### Course Objectives:

1) To impart basic knowledge on sewerage system including estimation of sewage quantity & design of sewers.

2) To provide a broad knowledge on sewage composition & its characteristics.

3) To provide information on disposal standards of effluents & also about various methods of sewage disposal.

4) To provide broad knowledge on various techniques of sewage treatment including advanced processes.

### Syllabus:

**Unit – I**

Sewerage schemes & sewerage system and their importance, collection & conveyance of sewage, Estimation of and sewage storm water quantity, fluctuation in sewage flow, Flow through sewer, Design of sewer, Construction & maintenance of sewer, Testing of sewer, Sewer appurtenances, Pumps & pumping stations.

**Unit – II**

Characteristics and analysis of wastewater Physical, chemical & biological parameters Cycles of decomposition, Oxygen demand i.e. BOD & COD, TOC, TOD, ThO, relative Stability, Population equivalent, Instrumentation involved in analysis, Natural methods of waste water disposal i.e. by land treatment & by dilution, Self purification capacity of stream, Oxygen sag analysis.

**Unit-III**

Unit operations for waste water treatment, Preliminary treatment such as screens, grit chamber, floatation tank, sedimentation etc. and chemical clarification, Role of micro-organism in biological treatment, Sewage filtration – theory & design. Testing filter its design & constructions, modifications in trickling filter.

**Unit-IV**

Methods of Biological Treatment (Theory & Design) – Activated Sludge Process, Oxidation ditch, Stabilization Ponds, Aerated Lagoon, Anaerobic Lagoons, Septic Tank & Imhoff tank, Rotating Biological contactor Sources & treatment of sludge, sludge thickening and digestion, sludge drying beds, sludge disposal.

**Unit-V**

Advanced Waste Water treatment – Need of advanced treatment, Diatomaceous earth filters, Ultra filtration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal – classification, composition, collection, & disposal methods. Sewage treatment plants using MBBR and SBR technology.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Plan & design a sewerage system for any area.

2) Determine various sewage characteristics.

3) Analyze various possible options for effluent disposal after comparing the effluent quality with standards available & plan its disposal accordingly.

4) Understand the waste water treatment system design & operation.

5) Carry out the design of waste water treatment system.

**Reference Books:**


i) Water Supply & Sanitary Engg. – G.S. Birdie – Dhanpat Rai Publishing Company, (P) Ltd. New Delhi

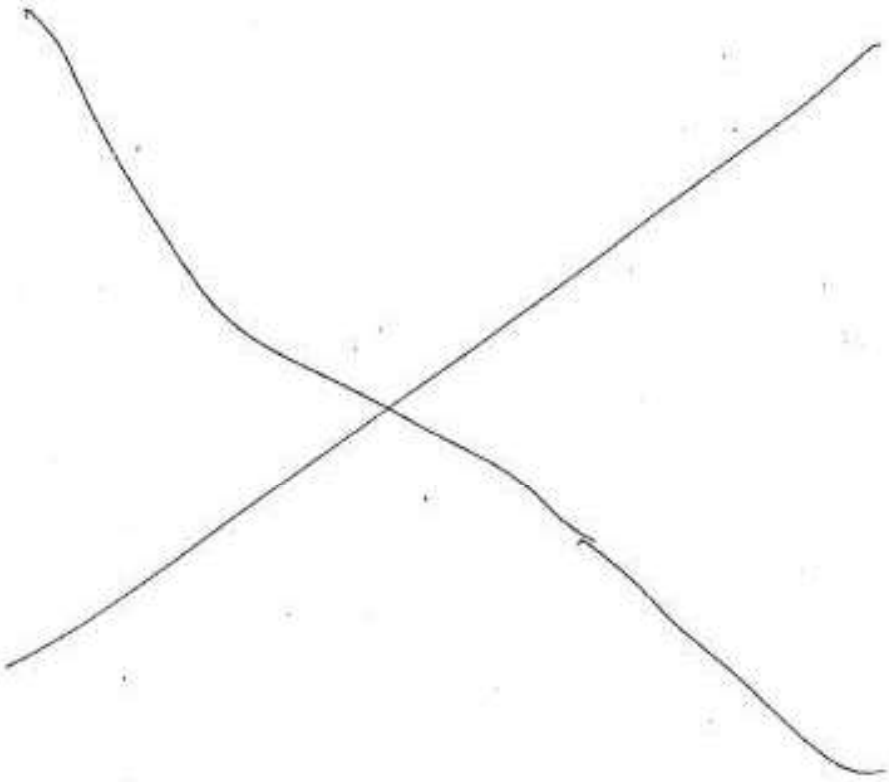
ii) Waste Water Engg. By B.C Punmia – Laxmi Publication (P) Ltd. New Delhi

iii) Environmental Engg. – M.L. Davis & D.A. Cornwell – Mc Graw Hill Company

iv) Chemistry for Environmental Engg. – Sawyer & Mc Carty – Mc Graw Hill Book Company New Delhi.

v) Water & Waste Water Technology – Mark J Hammer – Prentice – Hall of India, New Delhi

vi) Waste Water Engineering – Metcalf & Eddy – Mc Graw Hill Book Company New Delhi

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## Course Code: CEL – 703

## Course Name: Geotechnical Engineering - I

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 6 |

**Course Objectives:**

1) To inculcate the basic knowledge of soil such as its identification and classification, determination of various engineering properties and its suitability as a foundation/subgrade material.

2) To develop an understanding of the relationships between physical characteristics and mechanical properties of soils by experimentally measuring them.

3) To explain role of water in soil behaviour and how soil stresses, permeability and quantity of seepage including flow net are estimated.

4) To determine shear parameters and stress changes in soil due to foundation loads & estimate the magnitude and time-rate of settlement due to consolidation.

5) To apply the principles of soil mechanics in stability analysis of slopes and settlement calculations.

6) To compute the lateral earth pressure, select size of retaining walls and ensure safety against external forces and moments.

**Syllabus:**

**Unit-I Basic Definitions & Index Properties:**

Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behavior. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

**Unit-II Soil Water and Consolidation:**

Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flownets, uses of a flownet, Effective, neutral and total stresses.

Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one-dimensional consolidation. Consolidation tests, Fitting of curves. Normally and over consolidated clays. Determination of consolidation pressure settlement analysis. Calculation of total settlement.

**Unit-III Stress Distribution in Soils and Shear Strength of Soils:**

Stress distribution beneath loaded areas by Boussinesq and water guard's analysis. Newmark's influence chart. Contract pressure distribution.

Mohr – Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

**Unit – IV Stability of Slopes:**

Infinite and finite slopes. Types of slope failure, Rotational slips. Stress path. Stability curves. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

**Unit – V Lateral Earth Pressure:**

Active, passive and at rest conditions. Rankine, Coulomb, Terzaghi and Culmann,s theories. Analytical and graphical methods of determination of earth pressures on cohesionless and cohesive soils. Effect of surcharge, water table and wall friction. Arching in soils. Reinforced earth retaining walls.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the significance of the properties of soils, and also the experimental methods used to measure them.

2) Understand both the applications and limits of engineering methods commonly used to solve soil mechanics problems in Civil Engineering.

3) Recognize and be able to apply fundamental soil mechanics principles underlying common Civil Engineering applications.

4) Recognize behavior of soils in slopes, behind retaining structures and phenomena affecting foundation capacity and settlement.

5) Determine allowable bearing pressures and load carrying capabilities of different foundation systems.

**Reference Books:**


i) Soil Mech. & Found. Engg. By Dr. K.R. Arora – Std. Publishers Delhi

ii) Soil Mech. & Found. By Dr. B.C. Punmia – Laxmi Publications, Delhi

iii) Modern Geotech Engg. By Dr. Aram Singh-IBT Publishers, Delhi

iv) Geotech Engg. By C. Venkatramaiah – New Age International Publishers, Delhi

v) Soil Mech. & Found Engg. By S.K. Garg-Khanna Publishers, Delhi

vi) Soil Testing for Engg. By T.W. Lambe-John Wiley & Soms. Inc.


**List of Practical's:**

1. Moisture Content Determination. Oven Drying Method.
2. Grain Size Analysis – Mechanical Method.
3. Grain Size Analysis – Hydrometer Method.
4. Liquid & Plastic Limit Tests.
5. In-Place Density tests – Core Cutter Method, Sand Replacement Method.
6. Specific Gravity Tests.
7. Permeability Tests, Variable Head Method.
8. Compaction Test.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Triaxial Shear Test (Demonstration)
12. Consolidation test (Demonstration)
13. Visual classification test (Demonstration)

## Course Code: CEL – 704

## Course Name: Advanced Structural Design – I (R.C.C.)

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 6 |

### Course Objectives:

1) To understand the design concepts of various structures & detailing of reinforcements.

2) To understand the design of underground & elevated liquid retaining structures.

3) To understand the design of retaining walls.

4) To study the design of bridges according to IRC loadings.

5) To provide knowledge on basic concepts of prestressed concrete.

### Syllabus:

**Unit-I**

**Design of Water Tanks:**

Design requirements, Design of Tanks resting on ground and underground tanks, Rectangular and circular tanks.

**Unit-II**

**Design of Over Head Water tanks:**

Rectangular, Circular & intze type (Membrane analysis only), Design of staging.

**Unit-III**

**Earth Retaining Structures:**

Types of retaining walls, Stability of retaining walls, Design of retaining walls (Cantilever and counter fort type)

**Unit-IV**

**Design of Bridges:**

IRC loading for highway bridges, Slab bridges and T-beams bridges for highway loading (IRC Loads)

**Unit-V**

**Prestressed Concrete:**

Prestressing concepts, materials, systems of prestressing & prestress losses. Introduction to working & limit state design method.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Design the underground & elevated water retaining structures by applying various design concepts.

2) Design retaining walls by applying various design concepts

3) Design bridges by applying various design concepts.

4) Understand the concepts of prestressed concrete.

5) Design a structure/component, to meet desired needs within realistic constraints such as economy, environment friendly, safety, viable construction & its sustainability as per the codal provisions.

**Reference Books:**


i) Plain and Reinforced Concrete by O.P. Jain and Jai Krishna Vol. I & II

ii) R.C.C. Structures by B.C. Punmia

iii) Advance R.C. Design by N.K. Raju

iv) Essentials of Bridge Engineering by D.J. Victor.

v) Design of Bridge Structures by T.R. Jagadeesh & M.A. Jayaram

vi) Design of Bridges by N.K. Raju

vii) Prestressed Concrete by N.K. Raju

viii) Advanced Reinforced Concrete Design by PC Varghese

## Course Code: CEL – 705

## Course Name: Industrial Waste Treatment

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

### Course Objectives:

1) To provide broad knowledge on various methods of sewage disposal, their effects on water pollution & also provide information on various disposal standards.

2) To learn the basics of sewage composition & its characteristics.

3) To understand the 3R concepts and how to implement them.

4) To provide knowledge on various waste water treatment techniques.

5) To provide information on various rules & regulations regarding disposal of municipal wastes.

6) To provide information about various existing waste treatment & management techniques of various industries.

### Syllabus:

**Unit-I Problem of Water Pollution:**

Effects of wastes on streams and sewage treatment plant, natural purification of streams, oxygen sag curve, allowable organic load on streams, classification of stream, stream standards and effluent standards requirement of water for different purposes.

**Unit-II Sampling and Analysis of Wastewater:**

Sampling of waste waters, Grab, Composite and Integrated samples, analysis of waste water, Biochemical Oxygen Demand, Chemical Oxygen Demand and pH value of waste water, Toxicity of waste by Bioassay method.

**Pretreatment of Wastes:** Volume and strength reduction, salvage of materials, recovery of by products, reuse of waste water.

**Unit-III Conventional Methods of Treatment of Waste Water:**

Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal, Advance methods of treatment such as Reverse Osmosis, Ion Exchange Process, Electro Dialysis, Algal Harvesting etc

**Unit-IV Combined Treatment of Waste Water with Sewage:**

Municipal regulations, Sewer rental charges, Instrumentation in waste water treatment plants, Operation and maintenance of plants, Role of water pollution control board. Low cost Treatment Plant Effluent Treatment Plant Design and Operation.

**Unit-V**

Brief study of industrial processes and treatment methods of waste water from common industries such as Textile, Dairy, Paper and pulp, Tannery & Distillery.

Hazardous wastes-Impact handling and disposal

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**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Analyze various possible options for effluent disposal after comparing the effluent quality with standards available & plan its disposal accordingly.

2) Determine various sewage characteristics.

3) Understand the 3R concept and implement them accordingly.

4) Understand the waste water treatment system design & operation.

5) Understand waste treatment & management techniques employed by different industries.

**Reference Books:**


i) Liquid Waste of Industries – Theories, Practice and Treatment – N.L. Nemerow, Wesley Publishing Co.

ii) Treatment of Industrial Waste – E.B. Besselievre & Max Graw Hill Bok Company

iii) Waste Water Engg. – Treatment Disposal & Reuse – Metcalf & Eddy – Tata Mc Graw Will, New Delhi

iv) Waste Water Treatment – Arceivala – Tata Mc Graw Will, New Delhi

v) Industrial Pollution Control hand book – Lund H.F. Tata Mc Graw Will, New Delhi

## Course Code: CEP – 706

## Course Name: Minor Project - II

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 4 | 4 |

**Course Objectives:**

1) To develop an appreciation of civil engineering problems & have a feel of real life situations in planning & execution of projects.

2) To impart training of handling various types of civil engineering problems by use of conventional methods as well as software's.

3) To utilize the expertise in engineering to solve industry's technological problems.

4) To become innovative and professional in technology development, and system implementation.

5) To be able to function in their profession with social awareness and responsibility.

6) To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.

7) Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

**Syllabus:**

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of report of experimental work/software package on any specific problem of importance.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Identify, formulate various engineering problems and to use techniques, skills & modern engineering tools necessary for engineering practice.

2) Design, work on a set of drawings and conduct experimental studies on various engineering problems.

3) Learn different software's and apply them in solving various civil engineering problems.

4) Understand the ethical and professional responsibility and to know how to write professional and concise technical reports.

5) Interact with other streams of engineering in multidisciplinary system to manage various issues.

6) Develop the habit of working in group.

7) Develop innovative skills.

## Course Code: CET – 707

## Course Name: Tour / Training

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 1 | 1 |

**Course Objectives:**

1) To develop an appreciation and importance of civil Engineering in developing the infra structure.

2) To develop an understanding regarding the various engineering principals to be used in the field construction activities.

3) To emphasize on the use of the modern tools and plants used in the construction industry.

4) To build the necessary practical background and exposure to the field problems.

5) To develop a technical skill to prepare project documents.

**Syllabus:**

1. Each candidate shall go for 1 month (4 week) on field training at different organizations / sites of his / her choice after completion of their 6th Semester exams (in summer vacations) and shall submit a detailed report after completion of training.

2) Candidates will be taken to nearby places where civil engineering works are being carried out during the semester and they shall have to submit a detailed report of their visit.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the fundamental concepts of civil engineering, its necessity and importance.

2) Apply the knowledge in selecting suitable materials, and construction technique required for a particular construction activity.

3) Understand the significance of various suitable tools and plants to be used as per the given site conditions.

4) Manage the various activities of a construction project.

5) Execute and handle the projects individually and on team basis.

6) Engage in lifelong learning.

## Course Code: CEL – 801

## Course Name: Advanced Structural Design – II (Steel)

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 6 |

### Course Objectives:

1) To study the components of truss, loads on trusses, analysis and design of purlins and truss members.

2) To study the design of gantry girder, welded plate girder bridges as per standard loadings.

3) To study the design of trussed girder bridges, railway & highway bridges as per IRC loadings and Bridge Rules.

4) To study the design of water tanks.

5) To study the design of chimneys.

### Syllabus:

**Unit-I**

**Design of Industrial Building:** Dead Load, Live Load and wind load analysis for roof trusses, Design of purlins & members of truss. Design of gantry girder.

**Unit-II**

**Plate Girder Bridges:** Railway standard loading, Design of various components of plate girders bridges for railway & highways; Bearings for bridges.

**Unit-III**

**Trussed Girder Bridges:** Design of Foot over bridge, Design of various components of railway & highway bridges (IRC & railway standard loading)

**Unit-IV**

**Steel Water Tanks:** Design of Rectangular & Circular tanks with ordinary plates, Design of elevated water tanks with suspended bottoms, Pressed steel tanks.

**Unit-V**

**Design of Chimneys:** Design of self supporting type and Guyed Chimney.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Calculate forces on various members of the truss and design them.

2) Design gantry girder.

3) Design welded plate girder bridges and bridge bearings.

4) Design trussed girder bridges, railway & highway bridges as per IRC loadings.

5) Calculate wind load for chimneys and its design.

6) Design a structure/component, to meet desired needs within realistic constraints such as economy, environment friendly, safety, viable construction & its sustainability as per the codal provisions.

**Reference Books:**


i) Steel Structure By D. Ramchandra Vol. I & II.

ii) Steel Structure By Arya & Ajmani

iii) Essentials of Bridge Engineering by D. Johnson Victor

iv) Design of Steel Structures by B.C. Punmia.

v) Design of Steel Structure by S.K. Duggal

vi) Design of Steel Structures by Daya ratnam

vii) Indian standard codes.

## Course Code: CEL – 802

## Course Name: Hydraulic Structures

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 6 |

**Course Objectives:**

1) To study the different aspects of design of hydraulic structures.

2) To built the necessary theoretical background for the selection of a suitable site for a dam and a suitable dam for a given site location.

3) To emphasize on the basic design principle of the gravity dam & earthen dam

4) To carry out the stability & seepage analysis of various types of dams.

5) To provide knowledge on various hydraulic structures such as energy dissipaters, spillways & gates & understand their designs.

6) To understand the design of cross drainage structures for uninterrupted water supply in natural channels and manmade canals.

7) To provide a basic knowledge on various types of hydropower plants and their components.

**Syllabus:**

**Unit-I Gravity dams:**

Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

**Unit-II Earth and Rock fill dams:**

**Earth Dams:** Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

**Rock fill dams:** Types, merits and demerits, conditions favourable for their adoption

**Unit-III Cross drainage works:**

Types, selection of suitable type, design criteria, fluming of canal- Mitra & Chaturvedi methods. Design of Different types of CD works.

**Unit-IV Spillways, Energy dissipators and gates:**

Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways. Principles of energy dissipation, Energy dissipators based on tail water rating curve and jump height curves, Spillway crest gates – vertical lift and radial gates, their design principles and details.

**Unit-V Hydropower Plants:**

Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Design gravity dams & earthen dams.

2) Carry out seepage & stability analysis of dams.

3) Design cross drainage works.

4) Understand the concepts of spillways & energy dissipators.

5) Understand the concepts of hydropower plants.

**Reference Books:**


i) Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds

ii) Hydroelectric Hand Book by Creager

iii) Hydraulic Structures by Varshney

iv) Irrigation & Water Power Engg. By Punmia & Pandey

v) Water Power Engineering by Dandekar

vi) Irrigation Engineering & Hydraulic Structure by S.K. Garg.


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## Course Code: CEL – 803

## Course Name: Geotechnical Engineering - II

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 6 |

**Course Objectives:**

1) To understand the concepts of compaction & soil stabilization.

2) To emphasize on the importance of soil investigations & to determine the soil parameters needed to carry out foundation design.

3) To learn the subsurface exploration techniques and apply them to design the foundations.

4) To apply the principles of soil mechanics to design of shallow and deep foundations including bearing capacity, stability analysis of slopes and settlement calculations

5) To explain in what circumstances pile is needed and how do analysis the pile and pile group under various soil conditions

6) To explain fundamentals of soil dynamics and its application to machine foundation analysis including codal provisions

**Syllabus:**

**Unit-I Soil Improvement Techniques:**

Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control Lift thickness.

Soil stabilization: Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilisation and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

**Unit-II Soil Exploration and Foundations of Expansive and Collapsible Soils:**

Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them.

Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

**Unit-III Shallow Foundations:**

Type foundations shallow and deep. Bearing capacity of foundation on cohesionless and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity – Prandle, Terzaghi, Balla, Skempton, Meyerhof and Hansan. I.S. code on B.C. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

**Unit-IV Deep Foundation:**

Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesionless and cohesive soils. Static and dynamic formulae. Pile load test, Settlement of pile group, Negative skin friction, under-reamed piles and their design. Piles under tension, inclined and lateral load

Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

**Unit-V Sheet piles/Bulkheads and Machine Foundation:**

Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications.

Modes of vibration. Mess-spring analogy, Natural frequency. Effect of Vibration on soils. Vibration isolation. Criterion for design. Design of block foundation for impact type of machines.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the concepts of compaction & soil stabilization.

2) Learn various soil exploration techniques and evaluate the type of foundations to be required for various types of soil.

3) Design a suitable foundation system for any kind of problematic soils.

4) Evaluate the bearing capacity of foundation.

5) Evaluate pile capacity in the field using load tests, pile driving equations, and wave equation analysis to account for seismic loading.

6) Understand the concepts of various types of pile foundations & machine foundations.

**Reference Books:**


i) Soil Mechanics & Foundation Engg. By Dr. K. R. Arora- Std. Publishers Delhi

ii) Soil Mechanics & Foundation Engg. By B.C. Punmia – Laxmi Publiscations Delhi

iii) Modern Geotech. Engg. By Dr. Alam Singh –IBT Publishers Delhi.

iv) Geotech. Engg. By C.Venkatramaiah-New Age International Publishers, Delhi

v) Foundation Engineering. By Galeonards Mc Graw Hill Book Co. Inc.

vi) Found Design & Const. by MJ Towlinbou – Sor Pitman & Soms London


**List of Practical's:**

1. Triaxial Shear Test
2. Standard penetration test.
3. Demonstration of plate load test.
4. Vane shear test
5. Static core penetration test
6. Consolidation test

## Course Code: CEL – 804

## Course Name: Building Environment & Services

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To develop an understanding about the acoustics of a building.

2) To understand the fundamental concepts of ventilation in a building.

3) To understand about various preventive measures to be taken for corrosion & cracks in building & plan accordingly the building maintenance system.

4) To understand the concepts of illumination and plan accordingly the lighting system in building.

5) To understand the concepts of air conditioning, elevators & lifts installation, thermal insulation & stair case deign for a building.

6) To understand the requirements of fire fighting in a building and plan accordingly.

7) To plan the sanitation system of a building.

**Syllabus:**

**Unit-I Acoustics and Ventilation**

Characteristics of sound, Behaviour of sound, Defects of sound, Acoustic design, Sound absorption materials and techniques, Noise control in Building, Sound insulation of floors, walls, roof etc.

Functional requirements of ventilation, System of Ventilation, Factors and various considerations for improved natural ventilation. Artificial Ventilation (mechanical Ventilation), use of topography in improving ventilation.

**Unit II**

**Building Maintenance**

Causes of deterioration of Buildings, Approach to maintenance, reliability of maintenance system., pest control, Preventive maintenance in building and electric installations, checklist for inspection, Cracks in building (causes and effect), Maintenance of floors & roofs, Maintenance of brick masonry,. Corrosion in Reinforced concrete members, Prevention of leakage in building, Maintenance of windows, Doors and external Joinery (Timber), Building services required in building complexes.

**Unit-III**

**Electrification & Illumination**

System of distribution of electrical energy in building, Methods of wiring, System of wiring, Selection of wiring, conductor & insulators, Methods of earthing, Energy calculation, Fuses, electrical safety precautions.

Illumination, terminology, Different source of light Design of lighting scheme, Street lighting flood lighting, Lighting calculations, Various types of electrical circuits used in building i.e. Stair .case wiring corridor wiring, Connection of Fan, Bulb socket in circuit.

**Unit – IV**

**Services in Building**

Staircase design, Elevators, Escalators, Air Conditioning, Essentials of Air Conditioning, Systems. Thermal insulation of building (wall, roof, floor etc.), Methods of thermal insulation, Lifts and its types, Power requirement of lifts, Traffic analysis, Quality and quantity of service of lift operations, Lift installation.

**Unit-V**

**Fire Fighting & Sanitation**

Causes of fire, Classification of fire, Modes of fire. Fire lend, Modes of fire fighting. Types of fire extinguishers, provisions in building from fire safety angle. Additional requirement for multi storied building. Municipal rules & laws, Fire alarm, Fire hydrants.

Water seal and traps, sanitary noise and control, maintenance of water tanks & sewer lines, leakage in building and its prevention, Hot water supply in building. Basic principles of design of water supply system, Sanitary piping - troubles and causes, House - keeping in water and sanitary installation.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the significance & requirements of various services in a building and plan accordingly.

2) Understand the concepts of acoustics & ventilation in a building.

3) Plan the maintenance system of a building.

4) Understand the concepts of illumination & plan electrification of building.

5) Plan various services like air condition, thermal insulation, and lift installation in a building.

6) Plan fire safety for a building.

7) Plan sanitation system in a building.

**Reference Books:**


(i) Building Construction by B.C. Punmia

(ii) Building Construction by S.C. Rangwala

(iii) Building Services in High rise building by V.K. Jain

(iv) Maintenance of Building by A.C. Panchdhari

(v) Water Supply and Sanitary Installations by A.C. Panchdhari

(vi) Electrical Installations Estimating and Costing by J.B. Gupta


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## Course Code: CEP – 805

## Course Name: Major Project

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 8 | 8 |

**Course Objectives:**

1) To develop an appreciation of civil engineering problems & have a feel of real life situations in planning & execution of projects.

2) To impart training of handling various types of civil engineering problems by use of conventional methods as well as software's.

3) To utilize the expertise in engineering to solve industry's technological problems.

4) To become innovative and professional in technology development, and system implementation.

5) To be able to function in their profession with social awareness and responsibility.

6) To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.

7) Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

**Syllabus:**

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

**OR**

Shall submit a detailed report of report of experimental work/software package on any specific problem of importance.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Identify, formulate various engineering problems and to use techniques, skills & modern engineering tools necessary for engineering practice.

2) Design, work on a set of drawings and conduct experimental studies on various engineering problems.

3) Learn different software's and apply them in solving various civil engineering problems.

4) Understand the ethical and professional responsibility and to know how to write professional and concise technical reports.

5) Interact with other streams of engineering in multidisciplinary system to manage various issues.

6) Develop the habit of working in group.

7) Develop innovative skills.

## Course Code: BCEL – 501

## Course Name: Construction Planning & Management

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

### Course Objectives:

1) To make student conversant with the concepts and importance of the subject of construction planning & management.

2) To provide a broad knowledge on how to make bar chart, work break structure of a project, schedules.

3) To provide a broad knowledge on how to analyze a problem using various techniques of project management like CPM, PERT & optimization of time & cost of a project.

4) To provide knowledge on how to prepare a tender document, contract & arbitration for a project.

5) To provide an insight into various types of machinery used in construction works & various concepts of man & material management.

### Syllabus:

**Unit I:** Introduction, Significance of Construction Management, Roles of a project manager, Stakeholders in construction project, An overview of planning process, work break down structure, planning, sequencing, scheduling, preparing bar charts, milestone charts, limitations, Introduction to network techniques.

**Unit II: Network Techniques in Project Management**: Basics of developing a network, activities, events, numbering, rules for developing networks, network analysis using CPM, determination of schedules, critical paths, floats, probability concepts in networking, optimistic time, pessimistic time, mean, standard deviation, variance, slack, determination of critical path using PERT technique, Resources Smoothing & Leveling.

**Unit III: Time & Cost Optimization using Network Techniques:** Time computations using CPM & PERT, Probability of achieving completion time, Project cost, Direct & Indirect cost, Cost vs. Time curves, Total project cost & optimum duration, Contracting the network for cost optimization, Time cost optimization.

**Unit IV: Contracts:** Different types of contracts, Notice inviting tenders, Contract document, Rate list, Security deposit and Earnest money, Conditions of contract, Arbitration, Breach of contract.

**Unit V: Resource Management**: Factors affecting selection of construction equipments, Various types of equipments used in construction works like earth work, dredging, conveyance, hoisting, compacting & grouting, Equipment management, Manpower Management: Labour laws (Compensation Act etc.) & Human relations, Welfare facilities, Safety Management.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Understand the responsibilities & roles of a project manager.

2) Prepare schedule of activities including bar charts.

3) Analyze various problems of time & cost optimization using network techniques like CPM & PERT.

4) Develop a management system, incorporating constraints of time and cost, social, legal and ethical aspect of various phases of project life cycle.

5) Prepare tender & contract document for a construction project.

6) Plan and manage effectively for man, material & equipment of a project along with suitable safety measures.

**Books Recommended:**

1) B. C. Punmia & K. K. Khandelwal, Project Planning & Control with PERT & CPM, Laxmi Publishers

2) Gahlot & Dhir, Construction Management, New Age International Publishers.

3) K. K. Chitkara, Construction Project Management, Mc Graw Hill International Publishers.

4) L.S. Srinath, PERT & CPM – Principles & Applications, East West Press.

5) Sengupta & Guha, Construction Management & Planning, Mc Graw Hill Publishers.

6) U.K. Shrivastava, Construction Planning & Management

7) Neeraj Kumar Jha, Construction Project Management, Pearson Publishers.

## Course Code: BCEL – 502

## Course Name: Traffic Engineering

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To introduce the concepts of traffic engineering.

2) To provide a broad knowledge on traffic characteristics & various studies conducted in traffic engineering.

3) To analyze various requirements of traffic operation & control system & effectively design traffic signal.

4) To effectively design street light system.

5) To provide knowledge on concepts of accident studies & mass transportation system.

**Syllabus:**

**Unit –I Traffic Characteristics:**

(i) Road user's characteristics – general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. (ii) Vehicular characteristics: Characteristics affecting road design – width, height, length and other dimensions. Weight, power, speed and braking capacity of a vehicle.

**Unit –II Traffic Studies:**

(i) Spot Speed Studies and Volume Studies. (ii) Speed and Delay Studies-purpose, causes of delay, methods of conducting speed and delay studies (iii)Origin and Destination Studies (O&D): Various methods, collection and interpretation of data, planning and sampling (iv) Traffic capacity Studies: Volume, density, basic practical and possible capacities, level of service (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

**Unit – III Traffic Operations and Control:**

(i) Traffic regulations and various means of control. (ii) One-Way streets-advantages and limitations. (iii) Traffic signals-isolated signals coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal. Signs, markings and islands channelization of intersections Traffic rotary. Grade separated intersections and fly over and clover leaf function.

**Unit-IV Street Lighting:**

(i) Methods of light distribution (ii) Design of street lighting system (iii) Definitions-Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting (v) Fundamental factors of night vision.

**Unit-V Accident Studies & Mass Transportation:**

(i) Accident Studies: Causes of accidents, accident studies and records, condition and collision diagram, preventive measures (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

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**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Estimate basic characteristics of traffic stream.

2) Conduct traffic studies and estimate traffic data.

3) Analyze various requirements of effective traffic operation & control system.

4) Design traffic signal system.

5) Understand the concepts of street lighting system & design an efficient street lighting system.

6) Conduct accident studies & plan for preventive measures.

7) Get an insight into various existing forms of mass transportation in India.

**Reference Books:**


i) Traffic Engineering and transport Planning by L.R. Kadiyali, Khanna Publishers Delhi

ii) Traffic Engineering by Matson, W.S. Smith & F.W. Hurd

iii) G.J. Pingnataro, Principles of Traffic Engineering

iv) D.R. Drew, Traffic Flaw Theory

v) W.R. Mchsne and R.P.Roess "Traffic Engg"

vi) Wohl & Martin Traffic System Analysis for Engineering & Planners

vii) Highway Engg. by Justo & Khanna


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## Course Code: BCEL – 503

## Course Name: Water Resources Engineering - I

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To develop an understanding of various components of hydrological cycle, their behaviors & factors affecting it & solve problems on measurement on rainfall, infiltration, evaporation.

2) To understand concepts of Hydrometry & ground water hydrology.

3) To discuss the importance of estimation of runoff, analysis of rainfall data and various hydrographs and analyze various problems off runoff using various hydrograph theories.

4) To develop an understanding of various methods of flood estimation in general & flood frequency in detail.

5) To develop the concept of flood routing through reservoir & channel and its application in flood forecasting & flood control.

**Syllabus:**

**Unit –I Hydrology:**

Hydrological cycle, Precipitation and its measurement, Recording and non recording rain gauges, Estimating missing rainfall data, Rain gauge net works, Mean depth of precipitation over a drainage area, Mass rainfall curves, Intensity – duration curves, Depth – Area Duration curve, Infiltration and infiltration indices, Evaporation, evaporimeters, evapotranspiration & estimation.

**Unit - II**

**Hydrometry and Ground Water:**

Methods of Stream gauging, Direct and Indirect methods, Area – velocity method, Dilution technique methods, Ultrasonic method, Stage – Discharge Relationship (Rating curves).

Forms of subsurface water, Aquifer properties, Geological formations as aquifers, Hydraulics of wells, Steady flow into a well, Well loss, Introductions to ground water recharge methods and Rain water harvesting.

**Unit-III**

**Hydrographs:**

Runoff, Flow duration curve, Flow mass curve, Estimation of runoff, Rainfall – Runoff relationship, Hydrograph and its analysis, Unit hydrograph and its derivation for isolated and complex storms, S-curve hydrograph, Instantaneous unit hydrograph, Synthetic unit hydrograph.

**Unit-IV**

**Floods:** Foods and its estimation by different methods, Design flood by Unit hydrograph and Design Storm, Flood frequency studies: Gumbel's Method, Log Pearson Types – III Distribution, Lognormal distribution, Limitations of Frequency studies.

**Unit-V**

**Floods Routing:** Hydrologic Routing: Reservoir Routing – Modified Pul's method, Goodrich method. Channel Routing - Muskingum method

**Hydraulic Routing:** Numerical methods. Introduction to Time series models, Flood control measures.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the fundamental concepts of hydrological cycle, various hydrological parameters, measurement of rainfall & analysis of rainfall data.

2) Understand various methods of stream flow measurement & gauging.

3) Understand various concepts of ground water hydrology.

4) Understand the basic concepts of runoff, various hydrograph theories, & estimate runoff using various hydrograph theories.

5) Develop an understanding of flood estimation & estimate flood discharge using various methods.

6) Apply various flood routing techniques in river protection works & implement various types of flood control measures.

**Reference Books:**


i) Engineering. Hydrology – *J.* NEMEC – Prentice Hall.

ii) Hydrology for Engineers Linsley, Kohler, Paulnus – Tata Mc Graw Hill.

iii) Engineering. Hydrology by K. Subhramanya – Tata Mc Graw Hills Publ. Co.

iv) Hydrology & Flood Control by Santosh Kumar – Khanna Publishers.

v) Engineering. Hydrology by H.M. Raghunath.


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## Course Code: BCEL – 504

## Course Name: Fluid Mechanics - II

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 5 |

**Course Objectives:**

1) To develop and understanding of fluid flow patterns and learn to use boundary layer theory and drag.

2) To apply theories of laminar & turbulent flow to solve typical pipe flow problems in the field.

3) To apply boundary layer theory to estimate drag & lift for various shapes of the objects.

4) To classify the types of flows in open channel and also to design open channel sections in a most economical fashion with minimum wetted perimeter and learn about critical flows.

5) To study about non uniform flows in open channel and longitudinal slopes in open channel and also to learn about the characteristics of hydraulic jump.

6) To understand design philosophy of various types of pumps & turbines.

**Syllabus:**

**Unit-I**

**Turbulent Flow:** Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically rough boundaries, velocity distribution in turbulent flow, Resistance of smooth and artificially roughened pipes, Commercial pipes, aging of pipes.

**Pipe Flow Problems:** Losses due to sudden expansion and contraction, losses in pipe fittings and valves, Concepts of equivalent length, Hydraulic and energy gradient lines, Siphon, Pipes in series, in parallel, Branching of pipes.(Hardy Cross method)

**Pipe Network:** Water hammer (only quick closure case) transmission of power.

**Unit-II Forces on immersed bodies:**

Introduction, Force Exerted by a flowing fluid on a stationary body, Expression for Drag & Lift, Drag on a sphere, Terminal velocity of a Body, Drag on a cylinder. Introduction to Development of Lift on a Circular Cylinder and an Airfoil

**Unit –III**

**Uniform Flow in open Channels:**

Channel geometry and elements of channel section, Velocity distribution, Energy in open channel flow, Specific energy, Types of flow, Critical flow and its computations, Uniform flow and its computations, Chezy's and Manning's formulae, Determination of normal depth and velocity, Normal and critical slopes, Economical sections.

**Unit-IV**

**Gradually varied flow** – Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow-hydraulic jump in rectangular channels and its basic characteristics, Surges in open channels.

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**Unit-V**

**Introduction to Fluid Machinery: Turbines & Pumps**

**A) Turbines:** Classifications, definitions, Similarity laws, Specific speed and unit quantities, Pelton turbine – their construction and settings, Speed regulation, Dimensions of various elements. Action of jet, Torque, Power and efficiency for ideal case, Characteristics curves. Reaction turbines construction & setting, Draft tube theory, Runaway speed, Simple theory of design and characteristic curves, Cavitation.

**(B) Pumps:** Principle of working & criteria for selection of different types of pump, viz. Centrifugal, Reciprocating.

## Course Outcomes:

Upon completion of the course, the students will be able to:

1) Apply the theories of laminar & turbulent flow to solve various pipe flow problems.

2) Apply the theory of boundary layer to estimate lift & drag on various shapes of the objects.

3) Design the most efficient open channel section for carrying maximum discharge.

4) Understand the significance of critical flow & uniform flow & apply these concepts in gradually varied flow problems.

5) Understand the working principles of pump & turbine & subsequently apply them.

## Reference Books:


i) Fluid Mechanics – Modi & Seth – Standard Book house, Delhi.

ii) Open Channel Flow by Rangaraju – Tata Mc Graw – Hill Publishing Comp. Ltd., New Delhi.

iii) Fluid Mechanics – A.K. Jain – Khanna Publishers, Delhi.

iv) Fluid Mechanics, Hydraulics & Hydraulic Mechanics – K.R. Arora – Standard Publishers Distributors 1705-B, Nai Sarak, Delhi-6.

v) Hydraulics of open channels By Bakhmetiff B.A. (McGraw Hill, New York).

vi) Open Channel Hydraulics by Chow V.T. (McGraw Hill, New York).

vii) Hydraulic M/c in Engineering Hydraulics By Rouse.

viii) Open Chanel Flow by K. Subhramanya – Tata M.C. Gram Hill, New Delhi.


## List of Practical's:

1. Study the performances characteristics of Pelton Wheel
2. Study the performances characteristics of Francis Turbine.
3. Study the performances characteristics of Kaplan Turbine.
4. Calibration of multistory (Two) Pump & Study of characteristics of variable speed pump.
5. To study the performance & details of operation of Hyd. Ram.
6. Study of the characteristics of the Reciprocating pump at variable speed.

## Course Code: BCEL – 505

## Course Name: Structural Design & Drawing – I (R.C.C.)

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 5 |

### Course Objectives:

1) To understand the behavior of reinforced concrete components & systems subjected to gravity loads.

2) To study the stress strain behavior of steel and concrete.

3) To understand the concept of working stress & limit state method.

4) To provide knowledge on limit state design of beams, design for flexure, shear, torsion, bond & anchorage as per relevant IS codes.

5) To provide knowledge on design of slabs, columns, footings & staircases as per relevant IS codes.

### Syllabus:

**Unit-I Basic Principles of Structural Design:**

Mechanism of load transfer, Introduction to working stress limit state and ultimate load methods of design. Introduction of IS Codes 456, 13920.

***Design of Beams:*** Analysis and design of singly reinforced rectangular beams, Lintel, Cantilever, Simply supported and continuous beams.

**Unit-II Design of Beams:**

Doubly reinforced and Flanged Beam. Design for Shear and design for bond.

**Unit-III Design of Slabs:**

Slabs spanning in one direction, (Cantilever, Simply supported and Continuous slabs); Slabs spanning in two directions, Circular slabs.

**Unit-IV Columns & Footing:**

Short and long columns. Columns subjected to axial loads and bending moments (section with no tension). Isolated and combined footings, Strap footing. Raft foundation.

**Unit-V Staircases:**

Staircases with waist slab having equal and unequal flights with different support conditions, Tread-riser staircase.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Recognize the design philosophy of R.C.C. structures & apply the concepts of working stress method & limit state method.

2) Design different elements of R.C.C. structural elements like beams, slabs, columns, footings & staircases using relevant IS Codes.

3) Use the techniques, skills & modern engineering tools necessary for design & detailing.

4) Analyze and interpret the results using analytical tools & further plan, design & detail different components of civil engineering structures.

5) Design a structure/component, to meet desired needs within realistic constraints such as economy, environment friendly, safety, viable construction & its sustainability as per the codal provisions.

**Reference Books:**


i) Limit State Design by P.C. Varghese; Prentice Hall of India, New Delhi.

ii) Design of Reinforced Concrete by Pillai & Menon; Tata McGraw Hill, New Delhi.

iii) Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH.

iv) Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH.

v) Reinforced Concrete Design by S.N. Sinha, Tata McGraw Hill

vi) Plain and Reinforced Concrete by O.P. Jain and Jai Krishna, Nem Chand Pub.

vii) Limit State Design by A.K. Jain, Nem Chand Pub.

ix) Reinforced Cement Concrete by Winter & Nelson

## Course Code: BCEL – 506

## Course Name: Theory of Structures - I

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 5 |

### Course Objectives:

1) To develop an understanding of the behavior of structure under serviceability load.

2) To understand the mechanics of the material behavior of different type of structures.

3) To understand the concepts of analysis of indeterminate structures by various classical methods.

4) To make student aware of different methods of structural analysis.

### Syllabus:

**Unit-I**

**Deflection of beams**

Double Integration method. Area Moment Method and Slope-Deflection Method. Beam of variable cross section, M/EI diagram, Conjugate Beam Method.

**Unit-II**

**Virtual work and Energy Principles**

Principles of Virtual work applied to deformable bodies. Maxwell's Reciprocal theorems, Energy theorems, Application to pin jointed frames only.

**Unit – III Indeterminate Structures-I**

Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by Theorem of three moments, Effect of sinking and rotation of supports.

**Unit-IV Indeterminate Structures-II**

Analysis of beams and analysis of frames (with and without sway) by slope Deflection method.

**Unit-V Moment Distribution Method**

Moment distribution method for analysis of beams and analysis of frames (without sway) Three hinged arches of different shapes, Eddy's Theorem. Two Hinged and Fixed Arches. Analysis of frame using STAAD Pro Software.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Apply fundamental concepts of mathematics, statics, mechanics of deformable bodies, and principle of dynamics to the solution of fundamental civil engineering structural analysis problems.

2) Understand the significance of the basic mechanical properties of structural materials.

3) Understand the deformations of structures under loading and be able to apply various methods to determine the deformations.

4) Solve statically indeterminate structures using classical methods.

5) Develop the ability to analyze cable and arch structures.

**Reference Books:**


i) Ghali A & Neville M, Structural Analysis – A Unified classical and matrix Approach Chapman and Hall, New York.

ii) Wang C.K. Intermediate structural analysis, McGraw Hill, New York.

iii) Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.

iv) Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.

v) Norfis C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.


**List of Experiments:**

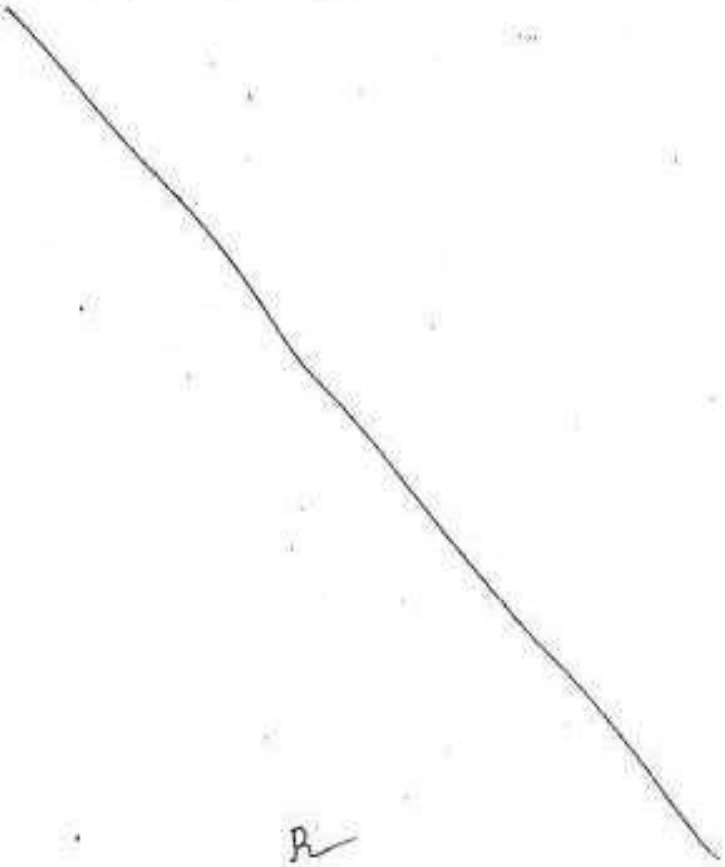
(i) Verification of Maxwell's theorem of reciprocal deflections with the help of a truss.

(ii) Verification of Maxwell's theorem of reciprocal deflections for a beam.

(iii) To determine experimentally the horizontal displacement of the roller end of a two hinged arch.

(iv) To determine the horizontal thrust in a three hinged arch for a given system of loads experimentally and verify the same with calculated values.

(v) Verification of frame using STAAD Pro Software.



## Course Code: BCEP – 507

## Course Name: Civil Lab

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

1) To make student conversant with the concepts of mix design of concrete.
2) To make student conversant with various tests performed on road materials.
3) To make student conversant with various tests performed on soil.

**Syllabus: List of Practical's:**

1. Mix design of concrete.
2. Job mix formula of bituminous aggregate mix by Marshall stability method.
3. Determination of bearing capacity of soil by Triaxial method.
4. Determination of bearing capacity of soil by plate load test.
5. Determination of bearing capacity of soil by SPT.
6. NDT using various methods for estimation of strength of old structure.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Analyze & Design mix of concrete
2) Carry out Marshall Stability test on bitumen & determine its value.
3) Determine the bearing capacity of soil by various tests.
4) Student will be able to access residual strength of old existing building.

## Course Code: BCEL – 602

## Course Name: Solid Wastes, Air & Noise Pollution

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Course Objectives:**

1) To provide broad knowledge on various aspects of planning & implementation of a solid wastes management system in a city/ town.

2) To provide a broad knowledge on various sources & effects of air pollution, air pollutants, existing air quality standards in India, various techniques to reduce the air pollutants in atmosphere.

3) To provide a basic knowledge on sources, effects of noise pollution & also how to reduce the pollution.

4) To provide an insight into various existing laws on air, noise & solid wastes in India.

5) To provide a basic knowledge on environment impact assessment.

**Syllabus:**

**Unit I: Solid Wastes:** Introduction, Classification, Municipal Solid Waste: Generation, Characterization (Physical, Chemical & Biological), Nuisance associate with solid wastes, Functional elements of solid waste management system, 3R policy, Waste reduction at source, On site storage - collection of waste at source, containers, bins, Material & resource recovery / recycling.

**Unit II:** Collection systems, Transportation of solid wastes, Routing & scheduling, Transfer stations, Transformations, Processing & Treatment options including Composting, Vermicomposting, Incineration, Refuse Derived Fuels, Pyrolysis, Biological digestion & Sanitary landfill, Existing solid waste management laws in India.

**Unit III: Air Pollution:** Sources and classification of air pollutants; Standards and guidelines for Air Quality Parameter, Existing air pollution laws in India, Effects of air pollutants on man, material, vegetation, art treasurers. Air pollution disasters, Economic effects, Global effects, Introduction to Indoor air pollution.

**Unit IV:** Meteorology & Air Pollution, Factors influencing air pollution, wind roses, atmospheric stability, plume behavior, estimation of plume rise, Control of air pollution: types of equipments, settling chambers, cyclones, separators, filters, ESP, scrubbers/ wet collectors, towers, Gaseous pollution control equipments.

**Unit V: Noise Pollution:** Sources, Effects, Scales of noise, Noise standards, Noise rating systems, Sound level meter, Control & prevention of noise pollution, Existing noise pollution laws in India, Introduction to environmental impact assessment: Necessity, Process of impact assessment, case study.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the basic concepts of solid waste management system.

2) Analyze the requirements of treatment & disposal of solid waste in a sustainable manner.

3) Understand the basic concepts of air pollution, its effects & pollutant dispersion theory.

4) Analyze various techniques required to control the air pollution.

5) Acquire knowledge about noise pollution, its effects & its control.

6) Acquire knowledge about various existing environmental legislations in India.

7) Understand the basics of environmental impact assessment.

**Books Recommended:**

1) Rowe, Peavy & Tchobanogolous, Environmental Engineering, Tata McGraw Hill Publications.

2) M. N. Rao & H. V. N Rao, Air pollution & Control, Tata McGraw Hill Publications.

3) Iqbal H. Khan and Nayed Ahsan, Text Book of Solid Wastes Management, CBS Publishers.

4) S.K. Garg, Sewage Disposal & Air Pollution Engineering, Khanna Publishers.

## Course Code: BCEL – 603

## Course Title: Environmental Impact Assessment & Ethics

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

### Course Objectives:

1) To develop an understanding about the requirements of environment impact assessment in modern day.

2) To provide a broad knowledge on the process of environmental impact assessment.

3) To provide a broad knowledge on various methods used in impact assessment.

4) To provide a practical knowledge on how to carry out environmental impact assessment process through various case studies.

5) To provide an insight into various existing environmental laws in India

### Detailed Syllabus:

**Unit I:** Environment and its components, Concept of Ecological imbalances, Carrying capacity and Sustainable development, EIA: Definitions, Necessity of EIA, Historical Evolution of EIA: Global, Indian EIA rules 1994 & 2006, Environmental clearance process in India, Step by step detailed procedure for carrying out EIA: Screening, Scoping, Baseline Studies, Impact Assessment, Public Consultation, Documentation, Mitigation, EMP, EIS, Life Cycle Assessment, Risk Assessment.

**Unit II: Environmental Impact Assessment Methodologies:** Characteristics of EIA Methods, Ad-hoc method, Checklist, Matrices, Networks, Overlays, Environmental Quality Index, Predictive Models, Comparative study of EIA Methodologies.

**Unit III: Prediction and assessment of impact on water & air environment:** Basic information of air & water quality, Data requirements for impact assessment, Existing standards for air & water quality (surface & subsurface), Identification of impacts, Prediction & assessment of impacts, Mitigation measures. Case Studies - Environmental Impacts of Road, Rail, Dam and thermal power projects.

**Unit IV: Prediction and assessment of impact on cultural & socio-economic environment:** Basic information on cultural resources like archaeological, historical structures, Cultural system, Basic information of socio-economic environment, Description of existing socio-economic environment, Identification of impacts, Prediction & assessment of impacts, Mitigation measures, R & R study.

**Unit V:** Environmental Legislations: List of prevalent environmental acts in India, Brief about provisions in Water Act 1974, Air Act 1981, EPA 1986, Objective of Ethics, Importance of Ethics, Environmental ethics in India, Environmental Audit: Introduction, Necessity, Types, and Process of audit.

### Course Outcomes:

Upon completion of the course, the students will be able to:

1) Understand the importance & concepts of carrying out EIA.

2) Acquire knowledge of current EIA process in India.

3) Acquire knowledge of various methods & data requirements for conducting EIA.

4) Analyze Impact's associated with various components of environment.

5) Plan for mitigation of the impacts & monitor the mitigation measures.

6) Acquire knowledge about Environmental Legislation, Ethics & Environmental Audit.

**Books Recommended:**

1) Y. Anjaneyulu & Valli Manickam, Environmental Impact Assessment Methodologies, B S Publishers

2) O. V. Nandimath, Handbook of Environmental Decision Making in India: An EIA Model, Oxford University Press.

3) R. L. Canter, Environmental Impact Assessment, Mc Graw Hill International Publishers International Edition.

4) R. R. Barthwal, Environmental Impact Assessment, New Age International Publishers.

## Course Code: BCEL – 604

## Course Name: Geotechnical Engineering - I

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 5 |

**Course Objectives:**

1) To inculcate the basic knowledge of soil such as its identification and classification, determination of various engineering properties and its suitability as a foundation/subgrade material.

2) To develop an understanding of the relationships between physical characteristics and mechanical properties of soils by experimentally measuring them.

3) To explain role of water in soil behaviour and how soil stresses, permeability and quantity of seepage including flow net are estimated.

4) To determine shear parameters and stress changes in soil due to foundation loads & estimate the magnitude and time-rate of settlement due to consolidation.

5) To apply the principles of soil mechanics in stability analysis of slopes and settlement calculations.

6) To compute the lateral earth pressure, select size of retaining walls and ensure safety against external forces and moments.

**Syllabus:**

**Unit-I Basic Definitions & Index Properties:**

Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behavior. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

**Unit-II Soil Water and Consolidation:**

Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flownets, uses of a flownet, Effective, neutral and total stresses.

Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one-dimensional consolidation. Consolidation tests, Fitting of curves. Normally and over consolidated clays. Determination of consolidation pressure settlement analysis. Calculation of total settlement.

**Unit-III Stress Distribution in Soils and Shear Strength of Soils:**

Stress distribution beneath loaded areas by Boussinesq and water guard's analysis. Newmark's influence chart. Contract pressure distribution.

Mohr – Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

**Unit – IV Stability of Slopes:**

Infinite and finite slopes. Types of slope failure, Rotational slips. Stress path. Stability curves. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

**Unit – V Lateral Earth Pressure:**

Active, passive and at rest conditions. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cohesionless and cohesive soils. Effect of surcharge, water table and wall friction. Arching in soils. Reinforced earth retaining walls.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the significance of the properties of soils, and also the experimental methods used to measure them.

2) Understand both the applications and limits of engineering methods commonly used to solve soil mechanics problems in Civil Engineering.

3) Recognize and be able to apply fundamental soil mechanics principles underlying common civil engineering applications.

4) Recognize behavior of soils in slopes, behind retaining structures and phenomena affecting foundation capacity and settlement.

5) Determine allowable bearing pressures and load carrying capabilities of different foundation systems.

**Reference Books:**


i) Soil Mech. & Found. Engg. By Dr. K.R. Arora – Std. Publishers Delhi

ii) Soil Mech. & Found. By Dr. B.C. Punmia – Laxmi Publications, Delhi

iii) Modern Geotech Engg. By Dr. Aram Singh-IBT Publishers, Delhi

iv) Geotech Engg. By C. Venkatramaiah – New Age International Publishers, Delhi

v) Soil Mech. & Found Engg. By S.K. Garg-Khanna Publishers, Delhi

vi) Soil Testing for Engg. By T.W. Lambe-John Wiley & Soms. Inc.


**List of Practical's:**

1. Moisture Content Determination. Oven Drying Method.
2. Grain Size Analysis – Mechanical Method.
3. Grain Size Analysis – Hydrometer Method.
4. Liquid & Plastic Limit Tests.
5. In-Place Density tests – Core Cutter Method, Sand Replacement Method.
6. Specific Gravity Tests.
7. Permeability Tests, Variable Head Method.
8. Compaction Test.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Triaxial Shear Test (Demonstration)
12. Consolidation test (Demonstration)
13. Visual classification test (Demonstration)

## Course Code: BCEL – 605

## Course Name: Structural Design & Drawing – II (Steel)

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 5 |

**Course Objectives:**

1) To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections.

2) To understand the behavior of steel structural components subjected to gravity loads.

3) To study the design of bolted and welded connections.

4) To study the behaviour and design of compression and tension members using simple and built-up sections.

5) To understand behaviour of flexural members and the design laterally restrained & unrestrained beams.

6) To design plate girders & stiffeners.

7) To use software's like STADD – PRO for design of tension & compression members.

**Syllabus:**

**Unit-I**

Various loads, Partial Load factors, Structural properties of steel, Design of structural connections – Bolted and Welded connections, eccentric connection. Codal provision.

**Unit-II**

Design of Tension members. Codal provision. Lug angles & Tension splices.

**Unit-III**

Design of Compression member, Design of columns-simple and compound, Lacings & Battens. Design of footings for steel structures, Slab base, gusseted base. Codal provision.

**Unit-IV**

Design of built up beams, web buckling and crippling, curtailment of flanges. Design of Laterally supported and unsupported beams , web buckling and crippling. Codal provision.

**Unit-V**

Design of plate girder. Curtailment of flanges, Design of stiffeners (bearing, Vertical and horizontal), Codal provision.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Follow and apply relevant and upcoming BIS standards and design philosophies prevalent in the world.

2) Understand the structural behavior of different steel structural elements and their analysis.

3) Design welded connections for both axial and eccentric forces.

4) Analyze the behaviour of bolted connections and design them.

5) Analyze and design different elements of steel structural elements under gravity loads and submit the designs in complete and concise manner.

6) Analyze and interpret the results using analytical tools and further plan design & detail different civil engineering structures.

7) Design a structure/component to meet desired needs within realistic constraints such as economy, environment friendly, safety, viable construction and its sustainability as per the codal provisions

**Reference Books:**


i) Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee

ii) Design of steel structures by P, Dayaratnam

iii) Design of steel structures by Ramchandra.


**Course Code: BCEL – 606**

**Course Name: Theory of Structures – II**

## Course Code: BCEL – 606

## Course Name: Theory of Structures – II

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 2 | 5 |

**Course Objectives:**

1) To understand the analytical procedure related to the analysis of building frame by some classical methods viz. Kani's methods and approximate methods of analysis.

2) To study the multi storey frames subjected to gravity loads and lateral loads

3) To understand matrix method and its application for computer based analysis of structure.

4) To understand the influence line concepts for indeterminate structures

5) To develop the skill to deals with the problems of moving loads in the structures & their analysis techniques.

6) To understand the concepts of plastic analysis of structures.

**Syllabus:**

**Unit-I**

Moment distribution method in analysis of frames with sway, Analysis of box frames, analysis of beams and frames by Kani's methods.

**Unit-II**

Analysis of tall frames, Calculation of various loads including wind and earthquake loads, Introduction to Codal provisions for lateral loads. Approximate analysis of multistorey frames for vertical and lateral loads.

**Unit-III**

Matrix method of structural analysis: Force method and displacement method.

**Unit-IV**

Rolling Loads and Influence Lines

Maximum SF and BM curves for various types of Rolling loads, EUDL, Influence Lines for Determinate Structural Beams, Trusses, Three Hinged Arches.

**Unit-V**

Plastic analysis of beams and frames

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Understand the structural actions viz. rotations and displacements, especially in building frames subjected to vertical and lateral loadings.

2) Analyze building framing system and its components under the action of gravity and lateral loads and thereby developing database for the design of the structure.

3) Identify, formulate and solve engineering problems and to effectively use and apply the computer friendly structural analysis techniques viz. stiffness and flexibility methods to the field problems.

4) Deal with the problems of moving loads in the structures and their analysis techniques such as influence line diagram.

5) Understand the concepts of plastic analysis of structures.

**Reference Books:**


i) Wang C.K. Intermediate structural analysis, McGraw Hill, New York.

ii) Kinney Sterling J. Indeterminate structural Analysis, Addison Wesley.

iii) Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.

iv) Norris C.H., Wilbur J.B. and Utkys Elementary Structural Analysis, McGraw Hill International, Tokyo.

v) Weaver W & Gere J.M. Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi.

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## Course Code: BCEP – 607

## Course Name: Minor Project - I

| L | T | P | Credit |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

1) To develop an appreciation of civil engineering problems & have a feel of real life situations in planning & execution of projects.

2) To impart training of handling various types of civil engineering problems by use of conventional methods as well as software's.

3) To utilize the expertise in engineering to solve industry's technological problems.

4) To become innovative and professional in technology development, and system implementation.

5) To be able to function in their profession with social awareness and responsibility.

6) To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.

7) Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

**Syllabus:**

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of report of experimental work/software package on any specific problem of importance.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

1) Identify, formulate various engineering problems and to use techniques, skills & modern engineering tools necessary for engineering practice.

2) Design, work on a set of drawings and conduct experimental studies on various engineering problems.

3) Learn different software's and apply them in solving various civil engineering problems.

4) Understand the ethical and professional responsibility and to know how to write professional and concise technical reports.

5) Interact with other streams of engineering in multidisciplinary system to manage various issues.

6) Develop the habit of working in group.

7) Develop innovative skills.

ME CTM

## 510301 (A) Infrastructure Project Management

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Unit-I**

Nature & Type of Infrastructure Projects. Characteristics, Scope and Status of Infrastructure Projects in India.

**Unit-II**

Issues of Developing, Funding, Financing Infrastructure Projects. Various Construction Procurement Options.

**Unit-III**

Uncertainties & Risks in Large Scale Construction Projects.

**Unit-IV**

Development of sustainable Infrastructure. Environmental Impact assessment of Infrastructure projects.

**Unit-V**

Management of Infrastructure projects. Role of I.T. in Infrastructure development.

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M.E. C-T M.

# 510302 (A) Urban Hydrology & Waste Management

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Unit-I**

Utilization of industrial waste in construction industry, Flyash as building material, ceramic insulator scrap as aggregate in concrete. Use of cement stabilized soil block as an alternative to burnt clay brick, urban solid waste and sludge as building material. Cement and building material from industrial waste, Fal-G brick. Pollution free production of innovative building materials and components. Concrete aggregate from demolition waste. Structural concrete using industrial waste.

**Unit-II**

**Industrial Waste:** Problem associated with industrial waste. Equalization, neutralization, volume reduction. House keeping method and Advanced treatments like adsorption, ion exchange, Chemical oxidation, Phosphorus removal, Nitrification, chemical precipitation, Reverse-osmosis, Electrodialysis.

**Unit-III**

**Wastewater Treatment:** Waste water generation, Collection, Construction of sewer lines, Sewer appurtenances, Disposal of wastewater & refuse, Recycling and reuse.

**Unit-IV**

**Surface & Subsurface Hydrology:** Hydrological cycle & its application in engineering. Precipitation, its types, forms & measurements, Rainfall data, DAD curve, Methods of average rainfall and losses.

**Ground Water:** Aquifer properties, groundwater properties, types and problems, well hydraulics, well losses, ground water investigation.

**Unit-V**

**Hydrographs:** Run off-discharge measurement, stage discharges, runoff computation, runoff simulation model, concept of hydrograph, component of hydrograph, unit hydrograph and its derivation, S-hydrograph, IUH hydrograph and its derivation, Synthetic unit hydrograph, Flood estimation techniques.

**Reference Books:**


i) Engineering Hydrology by K. Subhramanya – Tata Mc Graw Hill Publ. Co

ii) Hydrology & Water Resources Engineering by S. K. Garg – Khanna Publishers

iii) Sewage Disposal & Air Pollution Engineering by S. K. Garg – Khanna Publishers.

iv) Waste Water Engineering Treatment, Disposal & Reuse by Metcalf & Eddy – TMH Publishers.

M.Tech Env.

## 530301 (A) Principles and Design of Biological Treatment Systems

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

Unit-1

Principles Objectives of Biological Treatment, significance, aerobic and anaerobic treatment kinetics of biological growth, factor effecting growth- attached and suspended growth.

Types of wastewater. Constituents of wastewaters- Sources, Significant parameter. Fundamentals of Process- Kinetics, Zero order, First order Second order Reactions, Enzyme kinetics

Unit-2

Bio reactors: Types, Classification, Design principles, Design of wastewater treatment systems, Primary, secondary and tertiary treatments. Evaluation of Biokinetic Parameters

Unit-3

Biological Nitrification and denitrification. Suspended Growth process- Activated Sludge process: Introduction, Modifications, Membrane bioreactors, Waste stabilization ponds and Lagoons, Aerobic pond, facultative pond, anaerobic ponds, aerated Lagoons

Unit-4

Attached Growth Biological Treatment Systems: Trickling Filters, Rotating Biological Contactors. Anaerobic processes -Process fundamentals, Standard, high rate and hybrid reactors.

Unit-5

Anaerobic filters, Expanded /fluidized bed reactors, Up flow anaerobic sludge blanket reactors, Expanded granular bed reactors, Two stage/phase anaerobic reactors, Sludge Digestion, Sludge disposal.

Reference Books:


1. Benefield, L.D. and Randall C.W. Biological Processes Design for wastewaters, Prentice-Hall, Inc. Englewood Cliffs, 1982.
2. Grady Jr. C.P.L. and Lin H.C. Biological wastewater treatment: Theory and Applications, Marcel Dekker, Inc New York, 1980.
3. Metcalf & Eddy, Inc. Wastewater Engineering, Treatment and Reuse. 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.
4. Quasim S.R. Wastewater Treatment Plant, Planning Design & Operation, Technomic Publication, New York 1994.
5. Manual on "Sewerage and Sewage Treatment CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.

## 530302 (A) Urban Hydrology & Waste Management

| L | T | P | Credit |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

### Unit-I

Utilization of industrial waste in construction industry. Flyash as building material, ceramic insulator scrap as aggregate in concrete. Use of cement stabilized soil block as an alternative to burnt clay brick, urban solid waste and sludge as building material. Cement and building material from industrial waste, Eal-G brick, Pollution free production of innovative building materials and components. Concrete aggregate from demolition waste. Structural concrete using industrial waste.

### Unit-II

**Industrial Waste:** Problem associated with industrial waste. Equalization, neutralization, volume reduction. House keeping method and Advanced treatments like adsorption, Ion exchange, Chemical oxidation. Phosphorus removal, Nitrification, chemical precipitation, Reverse osmosis, Electrodialysis.

### Unit-III

**Wastewater Treatment:** Waste water generation, Collection, Construction of sewer lines, Sewer appurtenances. Disposal of wastewater & refuse. Recycling and reuse.

### Unit-IV

**Surface & Subsurface Hydrology:** Hydrological cycle & its application to engineering. Precipitation, its types, forms & measurements. Rainfall data, DAD curve. Methods of average rainfall and losses.

**Ground Water:** Aquifer properties, groundwater properties, types and problems, well hydraulics, well losses, ground water investigation.

### Unit-V

**Hydrographs:** Run off-discharge measurement, stage discharges, runoff computation, runoff simulation model, concept of hydrograph, component of hydrograph, unit hydrograph and its derivation, S-hydrograph, IUH hydrograph and its derivation, Synthetic unit hydrograph, Flood estimation techniques.

### Reference Books:


(i) Engineering Hydrology by K. Subhramanya – Tata Mc Graw Hill Publ. Co.

(ii) Hydrology & Water Resources Engineering by S. K. Garg – Khanna Publishers.

(iii) Sewage Disposal & Air Pollution Engineering by S. K. Garg – Khanna Publishers.

(iv) Waste Water Engineering, Treatment, Disposal & Reuse by Metcalf & Eddy – TMH Publishers.

## Course Code: 100205
## Course Name: Basic Civil Engineering & Mechanics

| L | T | P | Credit |
|---|---|---|---|
| 4 | 1 | 2 | 6 |

**Course Objectives:**

1. To understand the utility of various types of building materials.
2. To understand the location, construction detail and suitability of various building elements.
3. To determine the location of object on ground surface.
4. To stabilize the position of various object.
5. To understand the effects of system of forces on rigid body in static conditions.
6. Analysis of determinate structure (beam & truss)

**Syllabus:**

**Unit- I**

Building Materials: Stones, bricks, cement, timber - types, properties, test & uses, Introduction of concrete properties & Laboratory tests on concrete, curing of concrete and mortar Materials.

**Unit- II**

Surveying & Positioning: Introduction to surveying, Survey stations, Measurement of distances- conventional and EDM methods, Measurement of directions by different methods, Measurement of elevations by different methods, reciprocal leveling.

**Unit- III**

Mapping & Sensing: Mapping details and contouring, Plane tables and related devices. Introduction of theodolite. Measurement of areas and volumes, application of measurements in quantity computations, Introduction of remote sensing and its applications.

**Unit- IV**

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent co-planner forces, free body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses, method of joints, method of Sections. Frictional force in equilibrium problems.

**Unit -V**

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment of Inertia of Composite section, Radius of Gyration, Introduction to product of Inertia and Principle Axes. Support Reactions, Shear force and bending moment diagram for cantilever & simply supported beam with concentrated, distributed load and Couple.

**Course Outcomes:**

Upon completion of the course, the students will be able to:

**CO 1: Explain** concepts and terminologies of building materials, surveying and mechanics.
**CO 2: Apply** various methods for surveying and mechanics.
**CO 3: Determine** the location, area and volume of objects on ground surface.

**CO 4: Solve** the problems of surveying and mechanics by using various methods.
**CO 5: Analyse** the effects of system of forces on rigid bodies in static conditions.

**Text Books:**

1. Surveying, Vol – 1, Punmia B.C., Laxmi Publications, 17th edition, 2016
2. Building Material, B. C. Punmia, Laxmi Publications,2016
3. A textbook of Engineering Mechanics, D. S. Kumar, Katsons Publications, 2013

**Reference Books:**

1. Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3rd edition, 2013
2. Applied Mechanics, Prasad I.B., Khanna Publication 17th edition, 1996
3. Surveying, Duggal, Tata McGraw Hill New Delhi, 4th edition, 2013
4. Engineering Mechanics - Statics & Dynamics, R.C. Hibbler, Pearson Publications, 14thedition, 2015
5. Engineering Mechanics - statics dynamics, A. Boresi & Schmidt, Cengage learning,1st edition, 2008.
6. Applied Mechanics, R.K. Rajput, Laxmi Publications, 3rd edition, 2016

**List of Experiments:**

1. Study of various types of chain and tapes.
2. Measurement of distance involving direct and indirect ranging
3. Chain and tape survey of given area
4. Study of prismatic and surveyors compass
5. Measurement of direction by prismatic compass
6. Calculation of distance between two in accessible points by prismatic compass
7. Study of dumpy level, levelling staff and level field book
8. Exercise of differential levelling and flying levelling
9. Study of various types of a transits theodolite
10. Measurements of horizontal angle by repetition method
11. Determining the resultants force of coplanar concurrent and non-concurrent system of forces by graphical method
12. Determine forces in members of a perfect frame by graphical method.

Upon completion of the practical course, the students will be able to:
**CO 1: Follow** the guidelines for field surveying.
**CO 2: Follow** the working principles of survey instruments for measurements.
**CO 3: Measure** the horizontal distances, difference in elevation and angles of various points.
**CO 4: Detect** measurement errors and accordingly suggest corrections.
**CO 5: Interpret** survey data and compute areas.

# MANAGEMENT THEORY – 611CCM / MCTL 911
(510101)

**Unit-I**

**Special Features of Construction Industry:** Significance and importance of construction VIS AVIS other industry Importance of construction industry in National economy. Recognition of construction as industry. Significant differences between construction & other manufacturing. Production and process industry with special reference to planning. Execution finance and other aspects.

**Unit-II**

**Management Principles:** Concepts and theory. Historical developments. Management functions and processes. Forecasting, Planning Organizing. Directing coordinating, Motivating. Controlling and evaluating. Problems of construction industry influencing management process.

**Unit-III**

**Behavioral Sciences:** Principles. Historical development. Individual and group behavior. Group dynamics, Motivational theories, Leadership.

**Unit-IV**

**Organization Theory:** Introduction. Historical development, Growth of various models. Type of construction organization. Design of organization. Organization systems. Goals, Culture & environment. Developing and self learning organizations.

**Unit-V**

**Different Management Requirements:** Entrepreneurship. Corporate planning, SWOT and Goal analysis.

**Unit-VI**

**Construction Management:** Principles of Purchase and Marketing. Stores and site management on construction projects.

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(15) (10)

# QUANTITIVE METHODS

613CCM / MCTL 913 / MSTL 912 (N) / MENL 913
(510103)

**Unit-I**

**System Engineering:** System theory & principles; Decision theory & analysis; Decision under uncertainty & certainty, Risk analysis, Optimization theory for constrained and unconstrained & its techniques.

**Unit-II**

**Theory of Probability:** Definition of probability; Theorems of probability; Statistical methods; Probability distribution functions & its applications e.g. Normal, Log normal, Beta, Gamma, Pearson and Poisson's distribution; Introduction to correlation and regression; Simple & Multiple regression, Bivariate and Multivariate correlation.

**Unit-III**

**Programming Techniques-I:** Linear programming & applications, Graphical methods, Simplex method; Modified simplex method, Transportation problem; Assignment Problem.

**Unit-IV**

**Programming Techniques-II:**
Goal Programming; Integer Programming; Dynamic Programming; Non – Linear Programming.

**Unit-V**

**System Models:** Deterministic models; Probabilistic Models; Queuing model, Game theory; Simulation (Monte Carlo's Simulation).

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04/03/14

## MATERIALS AND EQUIPMENTS (CORE)

612CCM / MCTL 912 ~~/MSTL 914~~
MSTL 914/ MENL 912 (510102)

**Unit-I**

**General Properties of Construction Materials:** Physical properties like strength, Durability, Thermal effect, Sound insulation, Fire resistance, Corrosion resistance and radiation shielding.

**Unit-II**

**Concrete:** Ingredients and their properties, Design and production of concrete, Details of various steps of manufacture of concrete eg. Batching, Mixing, Transporting, Placing compacting and curing, Design and production of high strength Ready mix concrete.

**Unit-III**

**New Construction Materials:** Polymeric materials. Polymer concrete, Additives and admixtures in concrete, Light weight, Heavy and no fine concrete, Ferro cement and fiber reinforced concrete, high performance concrete and composite materials, roller compacted concrete.

**Unit-IV**

**Material Testing:** Laboratory and field testing of construction materials, Indian standard code requirements and procedures, Non destructive testing, Reporting and evaluating the experimentation.

**Unit-V**

**Construction Equipments:** Planning of construction equipments, Equipment characteristics, Operation and selection, Equipment cost. Different types of construction equipments eg. Power shovels, drag lines, Scrapper, Bulldozer, Tractor, Rippers, Motor graders, aggregate processing and batching plants, Cycle time and capacity ratings, Sizing and matching, Hot Mix plant , RMC Plant.

Reference Books:

1. V. Shantha Kumar, Concrete, Oxford University press.
2. A.M. Neville, Properties of concrete, Pearson
3. M.L. Gambhir, Concrete Technology, Tata Mc Graw Hill Pub. Co.
4. R.L. Peurifoy & C.L. Schexnaydev, Construction Planning, Equipment and methods, Mc-Graw Hill Higher Edition.
5. Construction equipment, its planning and application by Dr. Mahesh Verma, Pub. Metropolitan Book Co.(P) Ltd.

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04/03/14

(12)

# CONTRACT MANAGEMENT

614CCM / MCTL 514
(510104)

**Unit-I**

**Quantity Surveying:** Basic principles of estimating. Construction costs. Different methods and stages of estimating. Specification of construction items and method of statement. Principles of rate analysis and valuation.

**Unit-II**

**Claims and Arbitration:** Indian contract act and arbitration reconciliation act. Variations in work and conditions. Claims and disputes. Liquidated damages. Rights. Responsibilities and duties of client (Owner). Architect. Engineer. Contractor etc. Purchase order as contracts insurance contract and claims.

**Unit-III**

**Legal Frame Work of Construction:** Contract labors act 1970 and other acts and laws relating to labors management. Wages. Bonus and Industrial disputes.

**Unit-IV**

**Construction Contracts:** International contract rules and regulation.

**Unit-V**

**Contract Conditions:** Important contract clauses. Terms of payments. Retention. Acceptance and final payment. Time of completion. Extension of time. Maintenance period etc.

**Unit-VI**

**Special Contracts:** BOT projects, Variation in BOT projects. Infra structural projects.

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04/03/14

# Functional Planning Building Services
# &
# Maintenance Management

W.E.F. JULY 2014

(Elective) CCM-631/ MCTL 931 / MCTL 915 (N)/ MSTL 915 (N)/ MENL 915 / 5/0/05

Importance of building services, type of services required to keep facility usable, planning of services. Organization structures of services management. Role and administrative functions of supervisors.

**Fire Fighting:**
Fire load, classification of fire, class of fire, Basic requirement of the works for fighting system, various components of the fire fighting system. Maintenance required of the system, fire fighting in high-rise buildings, commercial/industrial complexes. Public buildings, checklist for fire safety.

**Lifts/Elevators, Escalators:**
Legal formalities for elevators, various types of lifts, working mechanisms of lift and escalators. Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts.

**Plumbing Services:**
Basics of Plumbing systems. Requirement of Plumbing works, Agency, Activity flow chart for plumbing work. Quality, checking of materials.

**Water Supply System:**
Water supply and distribution system is high-rise building & other complexes, pumps and pumping mechanisms. Operation & maintenance of fittings & fixtures of water supply & sanitary. Do's & Don'ts for water pipe networks.

Electrical network & appliances. Basics of single phase & three phase electrification, precautions and safety measures during electrification. Indian standard codes for electrical appliances & wiring operations & maintenance of network & appliances. Landscaping & Horticulture. Building maintenance management, applications of computer in service management.

**Air-Conditioning and Heating:**
Flowcharts of air conditioning & heating. Centralised systems, monitoring and working of the equipments. Checklist of inspection, Performance testing. Water proofing. Damp proofing & Termite proofing. Working procedure & stages of work of water proofing for W.C., Bathrooms, Terrace, sloping roof, Basements, tanks. Use of chemicals for water proofing treatment. Role of consultants. Damp proof course. Causes and precautions for Dampness. Anti-termite treatment at pre-construction and post-construction. Routine treatment and precautions.

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04/03/14

# CONSTRUCTION TECHNIQUES

621CCM / MCTL 921 / MSTL 921

## Unit-I

**Foundations:** Techniques of construction of piles, Cassions, Wells, Cofferdams and diaphragms, Drilling blasting, Underpinning, Shoring and shuttering of foundation.

## Unit-II

**Formwork:** Design and construction of different types of formworks and temporary structures, Stationary and slip formwork techniques, Formwork of special structures eg. Shells, Bridges, Towers etc.

**Steel Construction:** Fabrication and erection, Shop and insitu construction techniques, Different connections, Clearances and tolerances, Erection of steel structures like bridges, Chimneys and trusses.

## Unit-III

**Prefabrication:** Application in construction Modular coordination and standardization, joints and tolerances; Special equipments and plants for industrial production of prefabricated components, Pre-engineered Building.

## Unit-IV

**Prestressing:** Concept, Materials and Prestressing methods; Special equipments and plants for industrial production of prestressed components, Prestressing of bridge girders, Water tanks and special structures.

## Unit-V

**Advanced pavement construction Techniques:** Pavement construction using bitumen hot mix plant, Concrete road construction, Fibre reinforced pavement construction, Low cost road construction techniques, Pavement quality control.

**Reference Books:**


1. Soil Mechanics by Gopal Ranjan , New Age Publishers.
2. Mahesh Verma, Construction Equipment, its planning & Application, Metropolitan Book Co.(P) Ltd.,
3. Foundation Design Manual by Narayan V. Nayak
4. Prestressed concrete by Rajagopalan
5. Prestressed concrete by T.Y. Lin
6. Highway Engg by Justo and Khanna


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04/03/14

# CONSTRUCTION COST MANAGEMENT

623CCM / MCTL 923

**Unit-I**

**Project Cost Controlling**

Development of Network, Development of Cost/Schedule Control System Criteria (C/SCSE), Monitoring of Project Cost, Cost Schedule Algorithms.

**Unit-II**

**Cost Time Trade – off Analysis:**

Cost time trade – off curves, Non – convex discontinuous and discrete cost time trade – off curves, Crashing of projects, Heuristic methods, Siemen's method of project cost curve, Trade-off problems.

**Unit – III**

**Multi criteria Decision Making Methods:**

Analytical Hierarchy Process, and its application in planning and management, Introduction to Fuzzy Set Theory and its Application in MCDM.

**Unit-IV**

**Value Engineering:**

Principles of value engineering in Project Management, Value engineering technique, Job Plans, Life cycle costing and its applications.

**Unit-V**

**Productivity in Construction:** Definition of Productivity. Productivity measurements. Productivity of production components, Labors, Equipment and Material Capital Productivity. Planning, Designing and execution processes.

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04/03/14

# PROJECT MANAGEMENT

624CCM / MCTL 924 / MENL 924

## Unit-I

**Waste Management:** Introduction to waste and waste management. The concepts of waste productivity and its interrelationship with productivity. System concept of waste. Complementarily of waste and resource management.

## Unit-II

**Quality Management:** Concept of quality management. Product vs. system quality. Quality assurance. Quality circles. Total quality management. ISO-9000 series and construction project.

## Unit-III

**Materials & Inventory Management:** Material management. Requirements and purchases. Different methods of inventory management. Mathematical modeling. Suitable inventory model for construction.

## Unit-IV

**Risk Management:** Decision theory, Decision under certainty. Probility and uncertainty, Decision risks. Risks involved in decisions pertaining to construction industry. Risk. management, Insurance against risks.

## Unit-V

**Management Information System:** Principles of management information systems. Necessity and importance. Requirements of a good M.I.S. as a tool of data collection and dessimation. Use of table and charts. Artificial intelligence. Expert systems. Decision support systems.

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04/03/14

# Project Planning, Scheduling and Controls

CCM 618 / MCTL 925

## Unit – I

### Project Planning:

Introduction to Project Planning Process. Types of Project Plans-Project feasibility plan, Project preliminary plan, Project construction plan. Introduction to network techniques – CPM, PERT and Precedence network.

Project Work Breakdown – Levels of Project work breakdown. Identification of construction activities by work breakdown structure. Identification of building construction activities using CI/SfB Manual. Activity duration and methods of estimating activity duration – One time estimate three time estimates, trapezoidal distribution estimate. Duration estimation procedure.

## Unit - II

### Project Network Analysis:

Elements of Network, development of network, Numbering of events , Event times – Earliest events time and latest event time. Slack, critical events. Activity times – Earliest start time, Latest finish time, Float and critical activities. Network critical path and its significance. Network analysis by CPM – Defining scope of work, determining activities, establishing work package logic, preparation of network logic program and draft network. Development of structured network using network drawing rules, Numbering of events and computation of critical path. Numerical problems.

## Unit-III

### Network Analysis by PERT & PN:

Modeling PERT Network. Estimation of expected activity duration and computation of critical path. Uncertainty in project duration estimation.

Precedence Network Analysis – Modeling procedure analysis of time in PN. Use of PN in repetitive works network. Difference between PN and CPM. Application of Network techniques and their limitations.

## Unit-IV

### Resource Planning:

Planning construction Manpower, Scheduling Construction site workers. Planning Construction Materials Materials quantity estimation. Constrained and unconstrained resource scheduling. Resource usage profile, Resource smoothing, Resource leveling.

## Unit-V

### Cost Control: Project cost:

Direct and indirect, slope of direct cost curve, Total project cost and optimum duration, Contracting the network for cost optimization. Escalate & Variation in prices.

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04/03/14

# M.Tech. (Environmental Engineering )
## Environmental Chemistry & Microbiology MENL 911 /530101

Unit – I

Composition of pure & impure water, anamolus behavior of water, analysis & interpretation of quality parameters, gas laws, law of mass action, solubility product, ionic reaction, redox reaction etc. chemical equilibrium, inorganic impurities, conductance, pH, buffering capacities & ionic impurities, carbonate equilibrium, acidity alkalinity.

Unit-II

Colloidal chemistry, coagulation, effect of alkalinity, organic impurities, BOD, COD, TOC, DO, gaseous impurities, DO, nitrogen, hydrogen, sulfur, ammonia, chlorine.

Unit-III

Micro-organism & their classification, cell structure, eukaryotes, prokaryotes, viruses nutrition & growth condition – temperature, pH, oxygen, nutritional requirements for selective microbes, metabolic classification of microbes, phototrophs, chemotrophs.

Unit-IV

Energy generation in cell, metabolism, aerobic & anaerobic of carbohydrates, proteins, lipids, nucleic acid, hydrocarbon, control of metabolic reactions, kinetics of bacterial growth, substrate utilization, cell growth.

Unit-V

Nuisance organisms – algae, fungi, protozoa, indicator organisms, bacteriological tests.

Books :


1) C.N. Sawyer, P.L. Mc Carty and G.F. Parkin, Chemistry for Environmental Engineering and Sciences, Tata McGraw Hill, Fifth edition, New Delhi, 2003
2) G.W. Vanloon and S.J. Duffy "Environmental chemistry – a global perspective, Oxford University press, New York., 2000.
3) Tortora. G.J. B.R. Furke, and C.L. Case, "Microbiology – An Introduction" ( 4th Ed.), Benjamin/ Cummings Pub. Co., Inc. California, 1992.
4) R.E. McKinney, "Microbiology for Sanitary Engineers", Mc Graw Hill Book Company, 1962.
5) W.G. Walter and R.H. McBee, "General Microbiology", East West Edition, 1969.


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M.Tech. (Environmental Engineering )

## MATERIALS & EQUIPMENTS
## MENL 912 / 530102

1. **Concrete I:**
   Ingredients, their properties and effect on concrete, Admixtures and additives, steps in production of concrete, e.g. Batching, mixing, Transporting, placing, compaction, finishing and curing.

2. **Concrete II :**
   Statistical quality control of concrete, Principles of proportioning, introduction to various Mix Designing methods, I.S. method of Mix designing, Mix Designing for flexural strength, Mix designing for pumpable concrete, Mix designing for higher strength, Testing of concrete

3. **New Constructional Materials:**
   Ferro cement, Light weight concrete, High Density concrete, Self levelling concrete. High performance concrete, shortcrete or gunitting, Polymer concrete, Fiber reinforced concrete. Jet cement concrete, Waste material based concrete, No fine concrete, Rollar compacted concrete, Ready mix concrete, Hollow / solid concrete blocks, aerated concrete / foam concrete, ACP, Types of glasses (sheet, float, frosted, wired, Tempered, sandwiched insulating, bullet resistance, glare reducing, reflecting, intelligent) Plastics (poly carbonate, PVC, PVC Foam sheet, window / door pannel & frame).

4. **Construction Techniques / materials :**
   Water proofing, Damp proofing, Basic components & requirement of water proofing, water proofing types and their applications, Smart building materials and structures. Applications of smart materials, Alternate roofing materials, Geosynthetics.

5. **Construction Equipments:**
   Mechanization in construction: Mechanized vis a vis Labor intensive construction techniques, Equipment selection & operation, Power shovels, drag line, Scrapper, Bulldozer, Rippers, Motor grader, their cycle time & capacity rating. Sizing and matching.

Reference Books:


- A.M. Neville 'Properties of Concrete', ELBS, London, *A.M. Neville, 'Concrete Technology', ELBS, London.
- M.L. Gambhir, 'Concrete Technology', Tata Mc Graw Hill, * National Building Code, 1983.
- Peurifoy R.L. 'Construction Planning, Equipment & Methods', Mc Graw Hill book Co. Inc.
- Verma Mahesh, "Construction Equipments and its Planning & Application'', Metropolition Book Company, N. Delhi.
- M.L. Gambhir & Neha Jamwal " Building materials" Tata Mc Graw Hill, New Delhi.
- M.S. Shetti, " Concrete Technology " S. Chand Publications


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M.Tech. (Environmental Engineering )

**QUANTITIVE METHODS**

**MENL 913** / 530103

**Unit-I**

**System Engineering:** System theory & principles; Decision theory & analysis; Decision under uncertainty & certainty, Risk analysis, Optimization theory for constrained and unconstrained & its techniques.

*Unit-II*

**Theory of Probability:** Definition of probability; Theorems of probability; Statistical methods; Probability distribution functions & its applications e.g. Normal, Log normal, Beta, Gamma, Pearson and Poisson's distribution; Introduction to correlation and regression; Simple & Multiple regression, Bivariate and Multivariate correlation.

**Unit-III**

**Programming Techniques-I:** Linear programming & applications, Graphical methods, Simplex method; Modified simplex method, Transportation problem; Assignment Problem.

**Unit-IV**

**Programming Techniques-II:**

Goal Programming; Integer Programming; Dynamic Programming; Non – Linear Programming.

**Unit-V**

**System Models:** Deterministic models; Probabilistic Models; Queuing model, Game theory; Simulation (Monte Carlo's Simulation).

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# M.Tech. (Environmental Engineering )
## Solid Waste Management MENL 914 / 530104

Unit – I

Functional Elements of Solid Waste Management , Objective of Solid Waste Management, Principles of Municipal Solid Waste Management . Classification of solid waste, composition, physical, chemical & biological properties of municipal solid waste. Quantity of solid waste. Sampling & analysis of solid waste.

Unit-II

Collection, conveyance, separation & recycling of solid waste: Types of collection system, collection routes, equipments, transfer station, transport methods, material separation & recycling of MSW.

Unit-III

Disposal of solid waste – by land fill method: Classification, type, method, site consideration composition and control of gases, Leach ate control in land fills, surface water management, landfill operation & care. Remediation of old landfill sites.

Unit-IV

Disposal of solid waste by other methods: Thermal conversion technologies, Incineration, Pyrolysis, Gasification, environmental control system. Biological & Chemical conversion technologies aerobic composting, anaerobic digestion, other biological and chemical transformation.

Unit-V

Solid waste Management – legislative trend and planning issues: Major legislations, government agencies, future trend in planning. Hazardous solid waste management handling & Disposal. Disposal of Biomedical Waste, Demolition waste, Rubber & Plastic Waste etc.

Books :


1) Solid waste management in developing countries By A.O. Bhide
2) Hilary Theisen and Samuel A, Vigil, George Tehobanoglous, Integrated Solid Waste Management Mc Graw- Hill Yew York, 1993.
3) CPHEEO, Manual on Municipal Solid Waste management, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2000
4) Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.
5) Vesilind P.A., Worrell W and Reinhard, Solid waste Engineering, Thomson Learning Inc., Singapore, 2003
6) Charles A. Wentz, Hazardous Waste Management, Second Edition, Pub: McGraw Hill International Edition, New York, 1995.


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M.Tech. (Environmental Engineering )

# Functional Planning Building Services
# &
# Maintenance Management

## MENL 915 / 530105

Importance of building services, type of services required to keep facility usable, planning of services. Organization structures of services management. Role and administrative functions of supervisors.

**Fire Fighting**:
Fire load, classification of fire, class of fire, Basic requirement of the works for fighting system, various components of the fire fighting system. Maintenance required of the system, fire fighting in high-rise buildings, commercial/industrial complexes. Public buildings, checklist for fire safety.

**Lifts/Elevators, Escalators:**
Legal formalities for elevators, various types of lifts, working mechanisms of lift and escalators. Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts.

**Plumbing Services**:
Basics of Plumbing systems. Requirement of Plumbing works, Agency, Activity flow chart for plumbing work. Quality, checking of materials.

**Water Supply System:**
Water supply and distribution system is high-rise building & other complexes, pumps and pumping mechanisms. Operation & maintenance of fittings & fixtures of water supply & sanitary. Do's & Don'ts for water pipe networks.

Electrical network & appliances. Basics of single phase & three phase electrification, precautions and safety measures during electrification. Indian standard codes for electrical appliances & wiring operations & maintenance of network & appliances. Landscaping & Horticulture. Building maintenance management, applications of computer in service management.

**Air-Conditioning and Heating:**
Flowcharts of air conditioning & heating. Centralised systems, monitoring and working of the equipments, Checklist of inspection, Performance testing. Water proofing. Damp proofing & Termite proofing. Working procedure & stages of work of water proofing for W.C., Bathrooms, Terrace, sloping roof, Basements, tanks. Use of chemicals for water proofing treatment. Role of consultants. Damp proof course. Causes and precautions for Dampness. Anti-termite treatment at pre-construction and post-construction. Routine treatment and precautions.

Books:


1. Hand book of Designing & installations of Services in High rise building complexes: By V.K. Jain Khanna Publishers.
2. Water Supply & sanitary installation, by A.C. Panchadhari, Willey eastern limited
3. Mainteance of Building, A.C. Panchadhari, New Age International Ltd.
4. Building Construction, by S.C. Rangwala, Khanna Publishers


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# M.Tech. (Environmental Engineering )

## Air Pollution and Noise Pollution – MENL- 921 / 530201

**Unit – I**

**Air pollution its Sources & effects**

Definition of air pollution, Sources & Classifications of air pollutants Meteorology & air pollution, atmosphere layers & stability, Stack Plume behavior, Dispersion. Dispersion medals, effects of air pollution on human animals, plants, and Economic effects. Acid rain, global warming, ozone layer depletion. Indoor Air pollution & occupational diseases.

**Unit-II**

**Sampling and analysis of air pollutants:**

Methods & Equipements for sampling, stack sampling, analytical method for poilutant measurement, instrumental methods, Air pollution due to automobile, PCM, PAN, Major air pollution Episodes.

**Unit- III**

**Air pollution Control Equipments**

Objectives, types of Equipments, Settling chambers, separators, cyclones, traps, filters, ESP, Scrubbers/ wet collectors, towers, choice of equipments, Gaseous pollutant control equipment, odour & its control. Stake Monitoring kit, Auto exhaust analyser.

**Unit – IV**

**Air pollution prevention & Control Acts**

Air pollution survey, Air pollution Indices, Air pollution standards, Air quality & emission standards, Air pollution from major industrial operations, Air pollution control & Strategies, process changes, substitution of materials, zoning, Air pollution in Indian cities.

**Unit –V**

**Noise Pollution:**

Scale of noise, Measurement of sound, Noise Standards, Meter control and prevention of noise pollution, Properties of sound, Intensity and sound level, care colorization of noise effect of noise on people, Noise rating system, Community noise sources and criteria, Transmission of outdoor sound, Traffic noise and its reduction, sound level meter

**Books:**

Air pollution – By Stern & Stern.
Air pollution – Hanery Perkinson
Air pollution – M.N. Rao and A. V. N. Rao
Noise pollution – By Chatier

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# M.Tech. (Environmental Engineering )

## Advance Treatment Process – I (Water Supply Engg.)

## MENL - 922 / 530202

UNIT – I

Water Supply : Principles and design of distribution system, Equivalent pipe method, Hardy cross and section method, Electrical Network analogy method, maintenance of distribution system, corrosion and methods of control, computer applications in distribution network analysis.

UNIT-II

Quality of water: Factors affecting water quality in various sources, protection of water quality, classification of natural water with reference to the best use. Bacteriological quality of water, effect on health, standards of water for various uses, water quality index.

UNIT – III

Preliminary Treatment and Sedimentation : Degree of treatment required, various operation and flow sheet, preliminary treatment methods such as screening , coagulation , perikinetic and orthokinetic flocculation, ~~velocity gradient~~, coagulants and coagulant aids, polyelectrolyte, Sedimentation, class I and class II clarification, column settling test, zone and compression settling, ~~floatation~~, design of sedimentation tank- various types and their working. Tube settlers.

UNIT- IV

Filtration and Disinfection : Slow and rapid sand filters, theory of filtration, design, operation, performance and evaluation of filter, pressure filter, multi-media filter, diatomaceous earth filter, disinfection of water, free and combined chlorine, fixed bed disinfector.

UNIT-V

Non – conventional treatment units: Water softening, methods of ~~treatment~~, various practices, removal of fluorides, iron and manganese, taste and odour removal, Industrial water conditioning, ~~demineralization, scale and corrosion control~~, Langliear saturation index, management of water treatment plant residues, design of complete water treatment scheme.

Books:


1. Water Supply Engineering : By S.K. Garg
2. Water & Wastewater Technology by Mark J. Hammer (John Wiley & Sons Inch., 1986)
3. Water Supply Engineering by H.E. Babitt & J.J. Donald
4. Water & Wastewater Engg. Vol.I & II by G.M. Fair & J.C. Geyer (John Wiley & Sons, New York)
5. Manual on Water supply and Treatment – Expert Committee of G.O.I., Ministry of Urban Development New Delhi.
6. Water Supply & Sanitary Engineering by S.K. Husain (Oxford & IBH Publishing Co. New Delhi, India )


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# M.Tech. (Environmental Engineering )

## Advance Treatment Process – II (Sanitary Engg. )

## MENL-923 / 530203

UNIT – I

Waste Water collection : Estimation of sewage flow, fluctuations, self – cleansing velocity, storm water quantity, systems of sewerage. Design of sanitary and storm sewer,, sewer materials and appurtenances, construction of sewer line and its maintenance.

UNIT-II

Wastewater flow and characteristics: Estimate of domestic waste water flow, fluctuations, storm water and runoff, Characteristics of wastewater, oxygen requirement.

UNIT-III

Conventional treatments units: Units operations for treatment, preliminary, primary and biological methods, hydraulic design of screens, grit chamber, sedimentation and skimming tank, performance and evaluation. Trickling filters, flow sheet, loading rates, kinetics of BOD removal, design, construction and performance, conventional units, types and design, of stabilization ponds, aerated lagoons, oxidation ditch, septic and imhoff tank. Biological contractor, anaerobic filters, conventional and high rate anaerobic digester, sludge drying beds, thickening of sludge, vacuum filter Design of complete wastewater treatment plant.

UNIT-IV

Non-conventional units: Nitrogen conversion and removal, removal of phosphorous chemical oxidation, removal of dissolved inorganic substances.

UNIT-V

Disposal: Disposal by dilution, natural purification of streams, oxygen sage curve, maximum allowable loading, stream and effluent standards, standards of effluent for various purposes, sewage farming construction and maintenance of sewage farm.

Books:


i) Waste water Engineering (Treatment, Disposal, Reuse), By- Metcalf & Eddy, TMH Publication
ii) Waste Water Treament for pollution Control and Reuse by Soil. J. Arceivale & Shyam R Asdak , MC Graw Hill
iii) Waste Water treatment y MH Rao & A.K. Datta, Oxford & IBH Publication
iv) Waste Water Engienering (Concept & Design approach) by G.L. Karia & RA Christian PHI learning PVT Ltd.


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# PROJECT MANAGEMENT

530204 / 624CCM / MCTL 924 / MENL 924

**Unit-I**

**Waste Management:** Introduction to waste and waste management. The concepts of waste productivity and its interrelationship with productivity. System concept of waste. Complementarily of waste and resource management.

**Unit-II**

**Quality Management:** Concept of quality management. Product vs. system quality. Quality assurance. Quality circles. Total quality management. ISO-9000 series and construction project.

**Unit-III**

**Materials & Inventory Management:** Material management. Requirements and purchases. Different methods of inventory management. Mathematical modeling. Suitable inventory model for construction.

**Unit-IV**

**Risk Management;** Decision theory, Decision under certainty. Probility and uncertainty, Decision risks. Risks involved in decisions pertaining to construction industry. Risk. management, Insurance against risks.

**Unit-V**

**Management Information System:** Principles of management information systems. Necessity and importance. Requirements of a good M.I.S. as a tool of data collection and dessimation. Use of table and charts. Artificial intelligence. Expert systems. Decision support systems.

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Books:-

(1) Construction Project Management — By K.K Chitkara., TMH

(2) Construction and Project Management — By Prof. K. G. Krishnamurthy & SV Ravindra., CBS publishers

(3)

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# M.Tech. (Environmental Engineering )

## Environmental Impact Assessment and Ethics

MENL – 925 /530205

**Unit – I**

**Evolution of EIA:** Concepts, Methodologies, Screening, Scoping, Base line studies, Mitigation, Matrices, Check list. Methods for impact assessment : Background information, interaction matrix methodologies, network methodologies etc, environmental setting various factors, environmental impact assessment methodology, documentation and selection process, environmental indices and indicators for describing affected environment, Life cycle assessment.

**Unit – II**

**Prediction and assessment of impact for air and noise environment:** Basic information of air quality, identification of type and quantity of air pollutant, existing air quality and air quality standards, impact prediction and assessment, mitigation. Basic information of noise, existing noise levels and standards, prediction of noise levels and assessment of impact, mitigations.

**Unit – III**

**Prediction and assessment of impact for water and soil environment :** Basic information of water quality ( Surface water and ground water), water quality standards, identification of impact, prediction of impact and assessment, mitigations. Background information of soil environment, soil and ground water standards, prediction and assessment of impact for ground water and soil, mitigations.

**Unit – IV**

**Prediction and assessment of impact on cultural and socioeconomic environment :** Basic information on cultural resources, rules and regulations for cultural resources like archaeological, historical structures, Cultural system, prediction and assessment of impact, mitigations. Basic information of socioeconomic environment, description of existing socioeconomic environment, prediction and assessment of impact, mitigation, resettlement and rehabilitation.

**Unit – V**

**Environmental Ethics,** Objectives of ethics, Ethical theories, Code of Ethics, Importance and limitations of ethics, Environmental Ethics in India, List of prevalent Environmental Acts, Brief description related to the purpose with at least five important provisions Water (Prevention and control of pollution) Act 1974, Air (Prevention and control of pollution) Act 1981, Environmental Protection Act, 1986.

**Reference Books:**


1. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 1997.
2. John G. Rau and David C. Wooten (Ed), Environmental Impact Analysis Handbook, McGraw Hill Book Company.
3. Petter Watten (Eds.)- ' Environmental Impact Assessment Theory and Practice', Unwin Hyman, London (1988).


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