

Annexure - III

**Scheme & Syllabus for B.Tech. in Civil  
Engineering  
Choice Based Credit System (CBCS)  
(Semester III to VIII)**

For 1<sup>st</sup> batch (w.e.f. session 2016-17)  
2<sup>nd</sup> batch (w.e.f. session 2017-18)



**School of Engineering & Technology**  
CENTRAL UNIVERSITY OF HARYANA  
MAHENDERGARH-123031  
HARYANA

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25/5/18

**Scheme**  
**B. Tech. (Civil Engineering 2<sup>nd</sup> Year)**  
**THIRD SEMESTER**

CODE	SUBJECT	L	T	P	TOTAL Contact Hours	CREDIT	THEORY	PRACTICAL	INTERNAL ASSESSMENT	TOTAL MARKS
BTFO301	Fundamentals of Management	2	-	-	2	2	70	-	30	100
BT ENV-302	Environmental Studies(NC)	3	-	-	3	-	70	-	30	100
BTCE-303	Structural Analysis-I	3	1	-	4	4	70	-	30	100
BTCE-304	Fluid Mechanics-I	3	1	-	4	4	70	-	30	100
BTCE-305	Building Construction and Materials	3	1	-	4	4	70	-	30	100
	GEC*	3	1	-	4	4	70	-	30	100
BTCE-306	Structural Analysis-I(P)	-	-	2	2	1.0	-	35	15	50
BTCE-307	Fluid Mechanics-I(P)	-	-	2	2	1.0	-	35	15	50
	Innovation Technology Lab				5					
<b>TOTAL</b>					<b>30</b>	<b>20</b>	<b>420</b>	<b>70</b>	<b>210</b>	<b>700</b>

List of GEC for other department

CODE	GECSUBJECTS
BTCE-308	Basic of civil engineering
BTCE-309	Building Materials

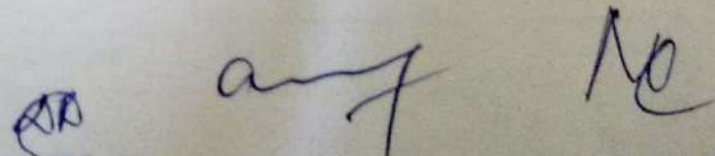
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### B. Tech. (Civil Engineering, IV Semester)

CODE	SUBJECT	L	T	P	TOTAL Contact Hours	CREDIT	THEORY	PRACTICAL	INTERNAL ASSESSMENT	TOTAL MARKS
BTCE-401	Structural Analysis-II	3	1	-	4	4	70	-	30	100
BTCE-402	Fluid Mechanics-II	3	1	-	4	4	70	-	30	100
BTCE-403	Surveying-I	3	1	-	4	4	70	-	30	100
BT ECO-404	Economics	3	-	-	3	3	70	-	30	100
	GEC**	3	1	-	4	4	70	-	30	100
	GEC***	3	1	-	4	4	70	-	30	100
BTCE-406	Fluid Mechanics-II (P)	-	-	2	2	1.0	-	35	15	50
BTCE-407	Surveying-I(P)	-	-	2	2	1.0	-	35	15	50
	Innovation Technology Lab				3					
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>420</b>	<b>70</b>	<b>210</b>	<b>700</b>

#### List of GEC for other department

CODE	GEC SUBJECTS
BTCE-408	Soil Engineering
BTCE-409	Building Construction

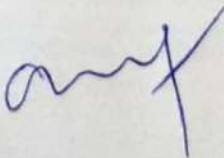




## B. Tech. (Civil Engineering, V<sup>th</sup> Semester)

CODE	SUBJECT	L	T	P	TOTAL Contact Hours	CREDIT	THEORY	PRACTICAL	INTERNAL ASSESSMENT	TOTAL MARKS
BTCE-501	Soil Mechanics	3	1	-	4	4	70	-	30	100
BTCE-502	Design of Concrete Structures-I	3	1	-	4	4	70	-	30	100
BTCE-503	Transportation Engineering-I	3	1	-	4	4	70	-	30	100
	GEC****	3	1	-	4	4	70	-	30	100
	DCEC	3	1	-	4	4	70	-	30	100
BTCE-504	Soil Mechanics (P)	-	-	2	2	1	-	35	15	50
BTCE-505	Concrete Lab	-	-	2	2	1	-	35	15	50
BTCE-506	Transportation Engineering I(P)	-	-	2	2	1	-	35	15	50
BTCE-507	Survey Camp	-	-	2	2	2	-	70	30	100
	Innovation Technology Lab				2					
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>350</b>	<b>175</b>	<b>225</b>	<b>750</b>

### List of DCEC

CODE	DCEC-SUBJECTS
BTCE-508	Structural Analysis-III

BTCE-509	Engineering Geology
BTCE-510	Engineering Hydrology

**List of GEC**

CODE	GEC-SUBJECTS
BTCE-511	Road Safety and Audit
BTCE-512	Ground Improvement Techniques

**B. Tech. (Civil Engineering, VI Semester)**

CODE	CORE SUBJECTS	L	T	P	TOTAL Contact Hours	CREDIT	THEORY	PRACTICAL	INTERNAL ASSESSMENT	TOTAL MARKS
BTCE-601	Design of Steel Structures-I	3	1	-	4	4	70	-	30	100
BTCE-602	Irrigation Engineering-I	3	1	-	4	4	70	-	30	100
BTCE-603	Water Supply & Treatment	3	-	-	3	3.0	70	-	30	100
BTCE-604	Geotechnology-I	3	1	-	4	4	70	-	30	100
	DCEC	3	1	-	4	4	70	-	30	100
BTCE-605	Geotechnology (P)	-	-	2	2	1.0	-	35	15	50
BTCE-606	Environmental Engineering-I(P)	-	-	2	2	1.0	-	35	15	50
BTCE-607	Computer Applications In Civil Engineering	-	-	2	2	1.0	-	35	15	50
	Innovation Technology Lab				5					
<b>TOTAL</b>					<b>30</b>	<b>22</b>	<b>350</b>	<b>105</b>	<b>195</b>	<b>650</b>

CODE	DCEC SUBJECTS
BTCE-608	Railway & Airport Engineering

BTCE-609	Geo-synthetics Engineering
BTCE-610	Environmental Impact Assessment
BTCE-611	Project Planning & Management
BTCE-612	Hydro Electric Power Development
BTCE-613	River Mechanics & Flood Control
BTCE-614	Design of Concrete Structures-II

**Scheme –B. Tech. (Civil Engineering 4<sup>th</sup> Year)**  
**SEVENTH SEMESTER**

CODE	CORE SUBJECTS	L	T	P	TOTAL Contact Hours	CREDIT	THEORY	INTERNAL ASSESSMENT PRACTICAL	INTERNAL MARKS	TOTAL MARKS
BTCE-701	Transportation Engineering-II	3	1	-	4	4	70	-	30	100
BTCE-702	Sewerage & Sewage Treatment	3	1	-	4	4	70	-	30	100
	DCEC	3	1	-	4	4	70	-	30	100
	DCEC	3	1	-	4	4	70	-	30	100
BTCE-703	Transportation Engineering-II(P)	-	-	2	2	1.0	-	35	15	50
BTCE-704	Environmental Engineering-II(P)	-	-	2	2	1.0	-	35	15	50
BTCE-705	Minor Project	-	-	4	4	2	-	35	15	50
	Innovation Technology Lab				4					
<b>TOTAL</b>					<b>28</b>	<b>20</b>	<b>280</b>	<b>105</b>	<b>165</b>	<b>550</b>

CODE	DCEC SUBJECTS
BTCE-706	Design of Hydraulic Structures
BTCE-707	Industrial Waste Water Treatment
BTCE-708	Ground Water Hydrology

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BTCE-709	Geotechnology-II
BTCE-710	Elements of Earthquake Engineering
BTCE-711	Machine Foundations
BTCE-712	Design of Steel Structures II
BTCE-713	Irrigation Engineering-II

### EIGHTH SEMESTER

CODE	SUBJECT	L	T	P	CREDIT	THEORY	PRACTICAL	INTERNAL ASSESSMENT	TOTAL MARKS
BTCE-801	Project Work	-	-	-	20	-	350	150	500
<b>TOTAL</b>					20	-	350	150	500

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# Fundamentals of Management

## BTFOM 301

Total Credit: 2  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### Unit – I

Meaning of management, Definitions of Management, Characteristics of management, Importance of Management; Management as Art, Science and Profession; Development of Management thoughts- –Fayol's principles of Management, Taylors Scientific Management, Elton Mayo's Human Relations School, System's Approach to Management; Principles of Management. Management Processes- Planning, Organizing, Staffing, Leading and Controlling; Delegation and Decentralization.

### Unit - II

Production Management : Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

### Unit - III

Marketing Management - Definition of marketing, Marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

### Unit - IV

An Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management, Role of Financial Manager. Brief Introduction to the concept of capital structure and various sources of finance.

### Reference Books:

1. Pandey I. P., (2015). Financial Management (11<sup>th</sup> ed.). New Delhi: Vikas Publishing House.
2. Kotler, P., Keller K. L. (2015). Marketing Management (5<sup>th</sup> ed.). Pearson.
3. Robbins, S. P., DeCenzo, D., Agarwal, M. N., & Bhattacharyya, S. (2011). Essentials of Management (6 ed.). New Delhi: Pearson Education.
4. Stoner J. F., Freeman R. E., Gilbert D. R.(2003). Manangement (6<sup>th</sup> ed.). Delhi: Pearson.



**STRUCTURAL ANALYSIS-I**  
**BT CE-303**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Analysis of stresses and strains:**

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, combined stresses in beams, shear stresses, Mohr's circle, Principle stresses and strains,

**UNIT-II**

**Bending moment and shear force in determinate beams and frames:**

Definitions and sign conventions, Classification of beams, Statically determinate problems, axial force, shear force and bending moment diagrams, relationship between load, shear force and bending moment.

**UNIT-III**

**Deflections in beams:**

Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method, Principle of virtual work, Maxwell's Law of Reciprocal Deflections.

**UNIT-IV**

**Theory of Columns:**

Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.

**Torsion of Circular Shafts:**

Torsion in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.

**Text Books:**

- 1 Strength of Materials Part-I, S.Timoshenko, Affiliated East-West Press, New.Delhi
- 2 Mechanics of Solids, Prasad, V. S. Galgotia Pub., New Delhi.
- 3 Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
- 4 Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., Newyork.
- 5 Structural Analysis, Bhavikatti S.S., Vikas Pub.House, N.Delhi.

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**ENVIROMENTAL STUDIES**  
**BT ENV 302**

Total Credit: 3  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**Unit 1:**

**Introduction to Environmental Science and Natural Resources**

The multidisciplinary nature of Environmental Studies. Definition, scope and importance, need for public awareness

Renewable and non-renewable resources: Land resources: Land as a resource, land degradation, soil erosion and desertification. Forest resources: Use and over-exploitation, deforestation, case studies. Water resources: Use and over-utilization of surface and ground water

**Unit 2:**

**Ecosystems, Biodiversity and its Conservation**

Concept of an ecosystem. Structure and function of an ecosystem. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids.

Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Hot-spots of biodiversity. Threats to biodiversity, Endangered and endemic species of India. Conservation of biodiversity.

**Unit 3:**

**Environmental Pollution, Environment policies & laws**

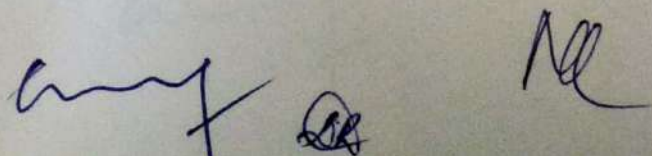
Definition, Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards. Solid waste management. Pollution case studies.

Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

**Unit 4:**

**Human Population and Environment and Fieldwork**

Human population growth, Impacts on environment, human health and welfare. Environmental Movements: Chipko, silent valley, Bishnois of Rajasthan.



Visit to a local area to document environmental assets—river/forest/grassland/hill/mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.

### Reference books

1. Cunningham, W.P. and Saigo, B.W., 1995. Environmental Science. W.M.C. Brown Publishers, New York, USA.
2. Enger, D.E. and Smith B.F., 1995. Environment Science—A Study of Interrelationships. W.M.C. Brown Publishers, New York, USA.
3. Gupta, P.K., 1997, Elements of Biotechnology, Rastogi Publications, Meerut.
4. Negi, B.S., 1991, Geography of Resources, KedarNath Ram Nath, Meerut.
5. Odum, E.P., 1996, Fundamentals of Ecology, Natraj Publishers, Dehradun.
6. Kaushik A and Kaushik C P. 2008. Perspectives in Environmental Studies, New age International Publishers, New Delhi.
7. Rastogi, V.B., 1993, Environmental Biology and Biochemistry, KedarNath Ram Nath, Meerut and Delhi.
8. Sharma, P.D., 1997, Ecology and Environment, Rastogi Publications, Meerut.
9. Singh, S., 1997, Physical-Geography, PrayagPustakBhavan, Allahabad.
10. Trivedi, P.R., 1999, Encyclopaedia of Ecology and Environment, 1-10, Indian Institute of Ecology and Environment, New Delhi.

**FLUID MECHANICS-I**  
**BT CE-304**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Introduction:**

Fluid properties, mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

**Kinematics of Fluid Flow:**

Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flownets.

**UNIT-II**

**Fluid Statics:**

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

**UNIT-III**

**Dynamic of Fluid Flow:**

Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, venturimeter, Orificemeter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.

**UNIT-IV**

**Boundary layer analysis:**

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

**Dimensional Analysis and Hydraulic Similitude:**

Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

**Text Books:**

- 1 Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
- 2 Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
- 3 Fluid Mechanics Through Problems by R.J.Garde
- 4 Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker

**BUILDING CONSTRUCTION AND MATERIALS**  
**BT CE-305**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**A. CONSTRUCTION**

**UNIT-I**

**Masonry Construction:**

Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

**Cavity and Partition Walls:**

Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.

**Foundation:**

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, Introduction to deep foundations i.e. pile and pier foundations.

**UNIT-II**

**Damp-Proofing and Water-Proofing:**

Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

**Roofs and Floors:**

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings.

**B.MATERIALS**

**UNIT-III**

**Stones:**

Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.

**Brick and Tiles:**

Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.

Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.

**Limes, Cement and Mortars:**

Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.

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Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

#### UNIT-IV

##### Timber:

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers.

##### Ferrous and Non-Ferrous Metals:

Definitions, manufacturing of cast iron, manufacturing of steel from pig iron, types of steel, marketable form of steel, manufacturing of aluminum and zinc.

##### Text Books:

Building Construction, Sushil Kumar, Standard Pub., N. Delhi

Building Material, Rangawala

Construction Engineering, Y.S. Sane

Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.

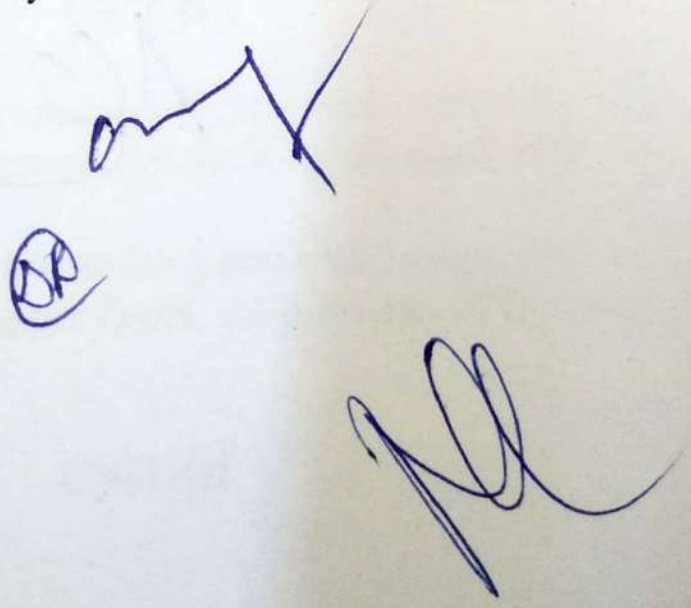
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**STRUCTURAL ANALYSIS-I (P)**  
**BT CE-306**

**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

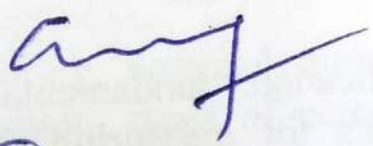
1. To determine Rockwell hardness number of the specimen of steel/soft metal.
2. To determine Brinnel hardness number of the specimen of steel/soft metal.
3. To study the behavior of ductile material under tension on Universal Testing Machine
4. To study the behavior of brittle material under tension on Universal Testing machine
5. To study the behavior of brittle material under compression on Universal Testing machine
6. To determine the modulus of rigidity of brass bar on torsion testing machine
7. To Verify of Clerk Maxwell's Reciprocal theorem of deflection.
8. Experimental and analytical study of behavior of struts with various end conditions.



**FLUID MECHANICS-I (P)**  
**BT CE-307**

**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

- To determine meta-centric height of the ship model.
- To verify the Bernoulli's theorem.
- To determine coefficient of discharge for an Orifice-meter.
- To determine coefficient of discharge of a venture-meter.
- To determine the various hydraulic coefficients of an Orifice ( $C_d, C_c, C_v$ ).
- To determine coefficient of discharge for an Orifice under variable head.
- To calibrate a given notch.
- To determine coefficient of discharge for a mouth piece.
- To study development of boundary layer over a flat plate.
- To study velocity distribution in a rectangular open channel.
- Experiment on Vortex formation (demonstration only)





GEC for other department

**BASIC OF CIVIL ENGINEERING**  
**BTCE-308**

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Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Analysis of stresses and strains:**

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, shear stresses, Types of beam, types of loading.

**UNIT-II**

**Fluid Mechanics**

Fluid properties, mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

**UNIT-III**

**Surveying:**

Fundamental Principles, objects, classification, fundamental principles, methods of fixing stations, Direct measurement, instruments for measuring distance, instruments for making stations, chaining of line, errors in chaining, tape corrections, Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines.

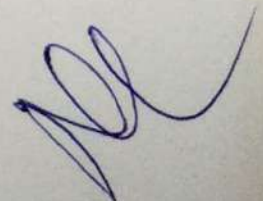
**UNIT-IV**

**Geology:**

Definition, object, scope and sub division of geology, geology around us. The interior of the earth, Importance of geology in Civil Engineering projects, weathering and erosion of the surface of the earth, Soil profile and its importance. Earthquakes and volcanoes.

**Text Book:**

- 1 Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
- 2 Structural Analysis, Bhavikatti S.S., VikasPub.House, N.Delhi.
- 3 Fluid Mechanics Through Problems by R.J.Garde
- 4 Engineering Fluid Mechanics by R.J.Garde&A.G.Mirajgaoker
- 5 Surveying Vol.I& II by B.C.Punmia
- 6 Surveying Vol.I by T.P.Kanitkar
- 7 A Text Book of Geology by P.K. Mukherjee
- 8 Physical and General Geology by S.K.Garg



**BUILDING MATERIALS**

BTCE-309

Total Credit: 4  
 Max. Marks: 100  
 Theory: 70  
 Internal: 30  
 Time Allowed: 3Hrs

**UNIT-I****Stones:**

Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.

**Brick and Tiles**

Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.

Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.

**UNIT-II****Limes, Cement and Mortars:**

Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.

Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

**UNIT-III****Timber**

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, important Indian timbers.

**Ferrous and Non-Ferrous Metals**

Definitions, manufacturing of cast iron, manufacturing of steel from pig iron, types of steel, marketable form of steel.

**UNIT-IV****Paints and Varnishes:**

Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes

**Text Books:**

1. Building Construction, Sushil Kumar, Standard Pub., N. Delhi
2. Building Material, Rangawala
3. Construction Engineering, Y.S. Sane
4. Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.

**STRUCTURAL ANALYSIS-II**  
**BT CE-401**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Statically Indeterminate Structures:**

Introduction, Static and Kinematic Indeterminacies, Castigliano's theorems, Strain energy method, Analysis of frames with one or two redundant members using Castigliano's 2<sup>nd</sup> theorem.

**UNIT-II**

**Slope deflection and moment Distribution Methods:**

Analysis of continuous beams & portal frames, Portal frames with inclined members.

**UNIT-III**

**Analysis of Two hinged and Three Hinged Arches:**

Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.

**UNIT-IV**

**Unsymmetrical Bending**

Introduction Centroidal principal axes of sections, Bending stresses in beam subjected to unsymmetrical bending, shear centre, shear centre for channel.

**Analysis of statically determinate trusses:**

Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections. Analysis of space trusses using tension coefficient method.

**BOOKS:**

1. Statically Indeterminate Structures, C.K. Wang, McGraw Hill Book Co., New York.
2. Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
3. Indeterminate Structures, R.L. Jindal, S. Chand & Co., New Delhi.
4. Theory of Structures, Vol. I, S.P. Gupta & G.S. Pandit, Tata McGraw Hill, New Delhi.

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**FLUID MECHANICS-II**  
**BT CE-402**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Laminar Flow:**

Navier Stoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere-Stokes'law.

**Flow through pipes:**

Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method.

**UNIT-II**

**Open Channel Flow:**

Type of flow in open channels, geometric parameters of channel section, uniform flow, most economical section (rectangular and trapezoidal), specific energy and critical depth, momentum in open channel, specific force, critical flow in rectangular channel, applications of specific energy and discharge diagrams to channel transition, metering flumes, hydraulic jump in rectangular channel, surges in open channels, positive and negative surges, gradually varied flow equation, surface profiles.

**UNIT-III**

**Compressible flow:**

Basic relationship of thermodynamics continuity, momentum and energy equations, propagation of elastic waves due to compression of fluid, Mach number and its significance, subsonic and supersonic flows, propagation of elastic wave due to disturbance in fluid mach cone, stagnation pressure.

**Drag and Lift:**

Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil.

**UNIT-IV**

**Pumps and Turbines:**

Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads, Force executed by fluid jet on stationary and moving flat vanes, Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, cavitation and setting of turbines.

**Books:**

- 1     Hydraulics & Fluid Mechanics by P.N.Modi and S.M.Seth
- 2     Flow in Open Channels by S.Subraminayam

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**SURVEYING-I**  
**BT CE-403**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Fundamental Principles of Surveying:**

Definition, objects, classification, fundamental principles, methods of fixing stations.

**Measurement of distances:**

Direct measurement, instruments for measuring distance, instruments for making stations, chaining of line, errors in chaining, tape corrections examples.

**Compass and Chain Traversing:**

Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines, local attraction, examples.

**UNIT-II**

**Leveling:**

Definition of terms used in leveling, types of levels and staff, temporary adjustment of levels, principles of leveling, reduction of levels, booking of staff readings, examples, contouring, characteristics of contours lines, locating contours, interpolation of contours.

**Plane Table Surveying:**

Plane table, methods of plane table surveying, radiation, intersection, traversing and resection, two point and three point problems.

**UNIT-III**

**Theodolite and Theodolite Traversing:**

Theodolites, temporary adjustment of theodolite, measurement of angles, repetition and reiteration method, traverse surveying with theodolite, checks in traversing, adjustment of closed traverse, examples.

**Tacheometry:**

Uses of tacheometry, principle of tacheometric surveying, instruments used in tacheometry, systems of tacheometric surveying-stadia system fixed hair method, determination of tacheometric constants, tangential systems, examples.

**UNIT-IV**

**Curves:**

Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves. Transition Curves-Length and types of transition curves, length of combined curve, examples.

Vertical Curves: Necessity and types of vertical curves.

**Text Books:**

- 1 Surveying Vol.I & II by B.C.Punmia

**ECONOMICS**  
**BT ECO-404**

Total Credit: 3  
Max Marks: 100  
Theory: 70  
Internal Assessment: 30  
Time Allowed: 3 hrs.

**Unit-I**

Definition of Economics-various definitions, circular flow of economic activity, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics. Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance, the concept of equilibrium

**Unit-II**

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand, the indifference curve theory, consumers surplus

**Unit-III**

Objective of business firm, Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale. Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

**Unit-IV**

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monoplistic Competition (Main features of these markets) Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices. Nature and characteristics of Indian economy (brief and elementary introduction), national income concept, Privatization - meaning, merits and demerits, Balance of payment, Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, IMF, World Bank.

**Text Books:**

1. Principles of Economics: P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory - K.K. Dewett (S.Chand)

**Reference Books:**

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1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics: S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy: Rudar Dutt & K.P.M. Sundhram
7. Indian Economy-Mishra &Puri


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**FLUID MECHANICS-II (P)**  
**BT CE-406**

Total Credit: 1  
Max. Marks: 50  
External: 35  
Internal: 15  
Time Allowed: 3Hrs

- 1 To determine the coefficient of drag by Stoke's law for spherical bodies.
- 2 To study the phenomenon of cavitation in pipe flow.
- 3 To determine the critical Reynold's number for flow through commercial pipes.
- 4 To determine the coefficient of discharge for flow over a broad crested weir.
- 5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
- 6 To study the scouring phenomenon around a bridge pier model.
- 7 To study the scouring phenomenon for flow past a spur.
- 8 To determine the characteristics of a centrifugal pump.
- 9 To study the momentum characteristics of a given jet.
- 10 To determine head loss due to various pipe fittings.





**SURVEYING-I (P)**  
**BT CE-407**

**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

- 1 Chain surveying: Chaining and chain traversing.
- 2 Compass traversing.
- 3 Plane tabling: methods of plane table surveying, two point problem.
- 4 To verify the, three point problem.
- 5 Leveling: Profile leveling and plotting of longitudinal section and cross sections.
6. Permanent adjustment of level.
7. Reciprocal leveling.
8. Contouring and preparation contour map.
9. Use of Tangent Clinometers.

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**SOIL ENGINEERING**  
**BTCE-408**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Soil Formation and Composition**

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, inter particle forces, soil structure, principal clay minerals.

**UNIT-II**

**Basic Soil Properties**

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

**UNIT-III**

**Classification of soils**

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

**UNIT-IV**

**Physical Geology:**

The external and internal geological forces causing changes, weathering and erosion of the surface of the earth. Geological work of ice, water and winds. Soil profile and its importance. Earthquakes and volcanoes

**Text Books:**

- 1 A Text Book of Geology by P.K. Mukherjee
- 2 Physical and General Geology by S.K.Garg
- 3 Basic and Applied Soil Mechanics by GopalRanjan, ASR Rao, New Age Intetrnational(P)Ltd.Pub.N.Delhi.
- 4 Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delh

**BUILDING CONSTRUCTION**  
**BTCE-409**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Foundation:**

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

**UNIT-II**

**Damp-Proofing and Water-Proofing:**

Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

**UNIT-III**

**Roofs and Floors:**

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings.

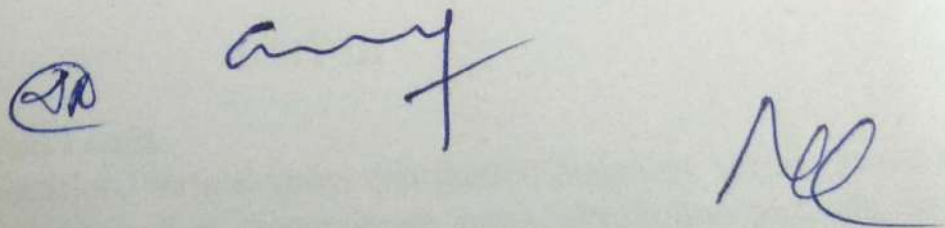
**UNIT-IV**

**Doors and Windows:**

Locations, sizes, types of doors and windows, fixtures and fasteners for doors and windows.

**Text Books:**

- 1 Building Construction, Sushil Kumar, Standard Pub., N. Delhi
- 2 Building Material, Rangawala
- 3 Construction Engineering, Y.S. Sane
- 4 Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.



**SOIL MECHANICS  
BT CE-501**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Basic Soil Properties**

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

**Classification of soils**

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System. Introduction to Clay minerals, their characteristics.

**UNIT-II**

**Effective Stress Concept**

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, seepage force, quick sand condition, critical hydraulic gradient.

**Permeability of soil**

Darcy's law, validity of Darcy's Law, seepage velocity, factors affecting permeability, Laboratory and field determination of permeability.

**Compaction**

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

**UNIT-III**

**Vertical Stress below Applied Loads**

Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis.

**Compressibility and Consolidation**

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement.

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**UNIT-IV****Shear Strength**

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

**Text Books**

1. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International(P)Ltd.Pub.N.Delhi.
2. Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
3. Engg.Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill,N.Delhi.
4. Geotechnical Engg. by P.Purshotam Raj,Tata Mcgraw Hill.
5. Principles of Geotechnical Engineering by B.M.Das,PWS KENT, Boston.



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## DESIGN OF CONCRETE STRUCTURES-I

BT CE-502

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

#### Elementary treatment of concrete technology:

Physical requirements of cement, aggregate, admixture and reinforcement, Strength and durability, shrinkage and creep. Design of concrete mixes, Acceptability criterion, I.S.Specifications.

#### Design Philosophies in Reinforced Concrete:

Working stress and limit state methods, Limit state v/s working stress method, Building code, Normal distribution curve, characteristic strength and characteristic loads, design values, Partial safety factors and factored loads, stress -strain relationship for concrete and steel.

### UNIT-II

#### Working Stress Method:

Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

#### Limit State Method:

Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement, design examples.

### UNIT-III

#### Analysis and Design of Sections in shear bond and torsion:

Diagonal tension, shear reinforcement, development length, Anchorage and flexural bond, Torsional, stiffness, equivalent shear, Torsional reinforcement, Design examples.

#### Columns and Footings:

Effective length, Minimum eccentricity, short columns under axial compression, Uniaxial and biaxial bending, slender columns, Isolated and wall footings, Design examples.

#### Serviceability Limit State:

Control of deflection, cracking, slenderness and vibrations, deflection and moment relationship for limiting values of span to depth, limit state of crack width, Design examples.

### UNIT-IV

#### Concrete Reinforcement and Detailing:

Requirements of good detailing cover to reinforcement, spacing of reinforcement, reinforcement splicing, Anchoring reinforcing bars in flexure and shear, curtailment of reinforcement.

#### One way and Two Ways Slabs:

General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Non-rectangular slabs, openings in slabs, Design examples.

#### Books:

1. Design of Reinforced Concrete Structures, P. Dayaratnam, Oxford & IBH Pub., N. Delhi.
  2. Reinforced Concrete-Limit State Design, A.K. Jain, Nem Chand & Bros., Roorkee.
  3. Reinforced Concrete, I.C. Syal & A.K. Goel, A.H. Wheeler & Co. Delhi.
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4. Reinforced Concrete Design, S.N.Sinha, TMH Pub., N.Delhi.
5. SP-16(S&T)-1980, 'Design Aids for Reinforced Concrete to IS:456, BIS, N.Delhi.
6. SP-34(S&T)-1987 'Handbook on Concrete Reinforcement and Detailing', BIS, N.Delhi.
7. Reinforced Concrete Design – Pillai and Menon, TMH, New Delhi.



TRANSPORTATION ENGINEERING -I  
BT CE-503

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

UNIT-I

**Introduction:**

Transportation and its importance. Different modes of transportation. Brief review of history of road development in India and abroad: Roman, Tresagne, Telford and Macadam constructions. Road patterns. Classification of roads, Objectives of highway planning, Planning surveys. Saturation system of planning.

**Highway Plans, Highway Alignment and Surveys:**

Main features of 20 years road development plans in India. Requirements of an ideal highway alignment. Factors affecting alignment. Surveys for highway alignment.

UNIT-II

**Cross Section Elements and Sight Distance Considerations:**

Cross section elements: friction, carriageway, formation width, land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance.

**Design Of Horizontal and Vertical Alignment:**

Effects of centrifugal force. Design of superelevation. Providing superelevation in the field. Radius of circular curves. Extra-widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

UNIT-III

**Traffic Characteristics And Traffic Surveys:**

Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.

**Traffic Control Devices:**

Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method. Intersections at grade and grade separated intersections. Design of a rotary. Types of grade separated intersections.

UNIT-IV

**Highway Materials: Soil And Aggregates:**

Subgrade soil evaluation: CBR test, plate bearing test. Desirable properties of aggregates. Various tests, testing procedures and IRC/IS specification for suitability of aggregates. Proportioning of aggregates for road construction by trial and error and Routhfuch method.

**Bituminous Materials and Bituminous Mixes:**



Types of bituminous materials: bitumen, tar, cutback and emulsions. Various tests, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

**Text Books:**

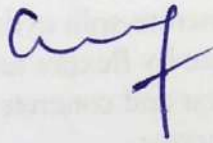
1. Highway Engg. by S.K.Khanna & C.E.G.Justo, Nem Chand & Bros,Roorkee.
2. Principles of Transportation and Highway Engg. by G.V.Rao,Tata McGraw Hill Pub., N.Delhi.
3. Traffic Engg. And Transport Planning by L.R.Kadiyali,Khanna Pub.Delhi.
4. Traffic Engg. by Matson, T.M.,Smith,W.S. and Hurd,P.W.McGraw Hill Book Co., New York.

**SOIL MECHANICS (P)**  
**BT CE-504**

**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:
  - i) Sand replacement method
  - ii) Core cutter method
6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.







**CONCRETE LAB**  
**BT CE-505**

Total Credit: 1  
Max. Marks: 50  
External: 35  
Internal: 15  
Time Allowed: 3Hrs

**Tests on Cement**

- 1 Standard consistency of cement using Vicat's apparatus.
- 2 Fineness of cement by Sieve analysis and Blaine's air permeability method.
- 3 Soundness of cement by Le-Chatelier's apparatus.
- 4 Setting time of cement, initial and final.
- 5 Compressive strength of cement.
- 6 Measurement of specific gravity of cement.
- 7 Measurement of Heat of Hydration of cement.

**Tests on Concrete**

- 1 Workability of cement concrete by (a) Slump test, (b) Compaction factor test, (c) Flow table test,.
- 2 Compressive strength of concrete by (a) Cube test, (b) Cylinder test
- 3 Indirect tensile strength of concrete-split cylinder test.
- 4 Modulus of rupture of Concrete by flexure test
- 5 Bond strength between steel bar and concrete by pull-out test
- 6 Non-destructive testing of concrete

**Books Recommended:**

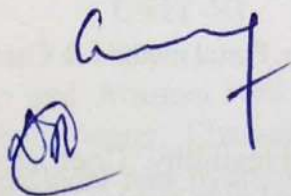

- 1 Concrete Manual-M.L.Gambhir, Dhanpat Rai & Sons, N.Delhi.
- 2 Concrete Technology-M.L.Gambhir, Tata McGeraw Hill, N.Delhi.
- 3 Concrete Technology – Nevellie, Pearson Education.

**TRANSPORTATION ENGINEERING-I (P)**  
**BT CE-506**

**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

**LIST OF EXPERIMENTS**

1. Aggregate Impact Test.
2. Los-Angeles Abrasion Test on Aggregates.
3. Dorry's Abrasion Test on Aggregates.
4. Deval Attrition Test on Aggregates.
5. Crushing Strength Test on Aggregates.
6. Penetration Test on Bitumen.
7. Ductility Test on Bitumen.
8. Viscosity Test on Bituminous Material
9. Softening Point Test on Bitumen.
10. Flash and Fire Point Test on Bitumen.

**UNIT-I**

**Influence lines:**

Introduction, influence lines for three hinged and two hinged arches, load position for Max.S.F. and B.M. at a section in the span.

**Influence Line for statically indeterminate Beams:** Muller-Breslau Principle, I.L. for B.M. & S.F. for continuous Beams.

**UNIT-II**

**Fixed Arches:** Expression for H and B.M. at a section, Elastic centre. **Rolling Loads:** Introduction, Single concentrated load, uniformly distributed load longer than span, shorter than span, two point loads, several point loads, Max.B.M. and S.F.Absolute, Max.B.M.

**UNIT-III**

**Kani's Method:** Analysis of continuous beams and simple frames, analysis of frames with different column lengths and end conditions of the bottom storey.

**Cable and suspension Bridges:**

Introduction, uniformly loaded cables, Temperature stresses, three hinged stiffening Girder and two hinged stiffening Girder.

**UNIT-IV**

**Approximate Analysis of frames:**

(i) for vertical loads, (ii) for lateral loads by Portal method & Cantilever method.

**Matrix Methods**

Introduction, Stiffness Coefficients, Flexibility Coefficients, Development of flexibility & stiffness matrices for plane frame, Global axis and local axis, analysis of plane frame, pin jointed and rigid jointed.

**Text Books:**

1. Indeterminate structures, R.L.Jindal S.Chand & Co.,N.Delhi.
2. Advanced Structural Analysis-A.K.Jain, NemChand & Bros.,Roorkee.
3. Structural Analysis-A Unified Approach, D.S.Prakash Rao,, University Press, Hyderabad.
4. Structural Analysis-A unified classical & Matrix Approach, A.Ghali & A.M.Neville,Chapman & Hall London.
5. Theory of Strucutres,- Vol. I&II,- S.P.Gupta & G.S.Pandit, Tata McGraw Hill, N.Delhi.
6. Basic Structural Analysis – C.S. Reddy, Tata McGraw Hill, New Delhi.

ENGINEERING GEOLOGY  
BT CE-509

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

UNIT-I

**Introduction:**

Definition, object, scope and sub division of geology, geology around us. The interior of the earth. Importance of geology in Civil Engineering projects.

**Physical Geology:**

The external and internal geological forces causing changes, weathering and erosion of the surface of the earth. Geological work of ice, water and winds. Soil profile and its importance. Earthquakes and volcanoes.

UNIT-II

**Mineralogy and Petrology:**

Definition and mineral and rocks. Classification of important rock forming minerals, simple description based on physical properties of minerals. Rocks of earth surface, classification of rocks. Mineral composition, Textures, structure and origin of Igneous, Sedimentary and Metamorphic rocks. Aims and principles of stratigraphy. Standard geological/stratigraphical time scale with its sub division and a short description based on engineering uses of formation of India.

**Structural Geology:**

Forms and structures of rocks. Bedding plane and outcrops Dip and Strike. Elementary ideas about fold, fault, joint and unconformity and recognition on outcrops. Importance of geological structures in Civil Engineering projects.

UNIT-III

**Applied Geology:**

Hydrogeology, water table, springs and Artesian well, aquifers, ground water in engineering projects. Artificial recharge of ground water, Elementary ideas of geological investigations. Remote sensing techniques for geological and hydrological survey and investigation. Uses of geological maps and interpretation of data, geological reports.

**Suitability and stability of foundation sites and abutments:**

Geological condition and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges etc. Landslides and Hill-slope stability.

UNIT-IV

**Improvement of foundation rocks:**

Precaution and treatment against faults, joints and ground water, retaining walls and other precautions.

**Geology and environment of earth.**

**Text Books:**

- 1 A Text Book of Geology by P.K. Mukherjee
- 2 Physical and General Geology by S.K.Garg
- 3 Engineering and General Geology by Prabin Singh
- 4 Introduction of Physical Geology by A Holmes

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# ENGINEERING HYDROLOGY

## BT CE-510

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

#### **Introduction:**

Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry, hypsometric curves.

#### **Precipitation:**

Forms and types of precipitation, characteristics of precipitation in India, measurement of precipitation, recording and non recording rain-gauge, rain-gauge station, rain-gauge network, estimation of missing data, presentation of rainfall data, mean precipitation, depth -area -duration relationship, frequency of point rainfall, intensity -duration- frequency curves, probable max. precipitation.

### UNIT-II

#### **Evaporation & Transpiration:**

Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control, transpiration, evapotranspiration and its measurement, Penman's equation and potential evapotranspiration.

#### **Infiltration:**

Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

### UNIT-III

#### **Runoff:**

Factor affecting run-off, estimation of runoff, rainfall-run off relationships, measurement of velocity-current meters, floats, area velocity method, moving boat and slope area method, electromagnetic, ultra-sonic and dilution methods of stream flow measurement, stage discharge relationship.

#### **Hydrograph:**

Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH, floods, rational methods, empirical formulae, UH method, flood frequency methods, Gumbel's method, graphical method, design flood.

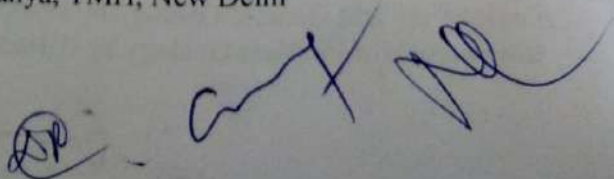
### UNIT-IV

#### **Ground Water:**

Occurrence, types of aquifers, compressibility of aquifers, water table and its effects on fluctuations, wells and springs, movement of ground water, Darcy's law, permeability and its determination, porosity, specific yield and specific retention, storage coefficient, transmissibility.

#### **Text Books:**

- 1 Engineering Hydrology by K.Subramanya, TMH, New Delhi
- 2 Hydrology by H.M.Raghunath.



- 3 Hydrology for Engineers by Linsely, Kohler, Paulhus.
- 4 Elementary Hydrology by V.P.Singh.





# ROAD SAFETY AUDIT

## BT CE 511

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

Introduction: Road Safety scenario in India and World, Road Accident Characteristics. Need of Planning for Network, Land Use and Road Environment for Safety, Designing for Safety: Road Link Design, Junctions.

### UNIT-II

Road Safety Auditing: An Introduction, Concept and need of Road Safety Audit (RSA). Procedures in RSA, design standards, audit tasks, stages of road safety audit, Road Safety Audit Types, Road design issues in RSA's. Overview of Road Safety Hazards.

### UNIT-III

Safe System Approach- A Global Perspective, Speed Management & safety, Safe System and Speed & Assessing speed limit, Type of speed limit & Speed zone signing Infrastructure to support safe speed feedback and enforcement.

### UNIT-IV

Introduction to Road Safety Engineering and Crash Investigation, Human Factors Relating to Crashes/Accidents, Crash/Accident Investigation & Crash Problem Diagnosing, Crash/Accident Costing, Economic Appraisal. Safety provisions for workers at construction site, Construction Zone markings, signs.

#### Reference Books:

1. Highway Engineering by Khanna and Justo, Nem Chand & Brothers, Roorkee
2. BABKOV, V.F. 'Road conditions and Traffic Safety', MIR publications, - 1975.
3. Kadiyali, L.R., 'Traffic Engineering and Transport Planning', Khanna Publications.
4. Pignataro, Louis, 'Traffic Engineering - Theory and Practice', John Wiley.
5. Papacoastas 'Introduction to Transportation Engineering' -Prentice
6. Road safety audit Manual

**GROUND IMPROVEMENT TECHNIQUES**  
**BT CE 512**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

Introduction to different methods of ground improvement and its importance. Mechanical method of ground improvement, Ruthfuch method; methods based on PI.

**UNIT-II**

Compaction & consolidation techniques viz. pre-compression, compaction piles, vibro-compaction (Vibro-floatation, Terra-probe, vibro-replacement, concrete columns & vibro-displacement), Dynamic compaction, explosive compaction.

**UNIT-III**

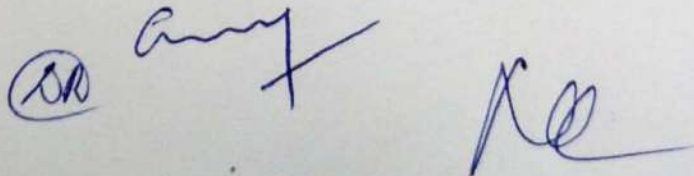
Soil Reinforcement, load transfer mechanism, strength development, anchored earth. In-situ reinforcement techniques viz soil nailing, reticuled micropiles, soil dowels and anchors. Grouts, properties, penetration, clay, cement clay, cement, clay-chemical, chemical and Bituminous grouts, grouting methods

**UNIT-IV**

Reinforced earth; Introduction, Mechanism of reinforced types of reinforcement strength characteristics, reinforced earth retaining walls, abutments, earth slopes.

**Reference Books:**

1. Ground Improvement Techniques by P. Purushotham Raj, Tata McGraw Hill,
2. Engineering Treatment of Soils by F.G. Bell, E & FN Spon Publishers, UK.Pignataro,
3. Arora.K.R., Soil mechanics and foundation Engineering,SPD,2001



**B.TECH (CIVIL ENGINEERING)  
VI SEMESTER**

DESIGN OF STEEL STRUCTURES-I  
BT CE-601

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

UNIT-I

**Introduction:**

Properties of structural steel. I.S. Rolled sections and I.S. specification.

**Connections:**

Importance, various types of connections, simple and moment resistant, riveted, bolted and welded connections.

**Design of Tension Members:**

Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

UNIT-II

**Design of Compression Members:**

Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members.

**Column Bases and Footings:**

Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading, design of grillage foundations.

UNIT-III

**Design of Beams:**

Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling.

UNIT-IV

**Gantry Girders:**

Introduction, various loads, specifications, design of gantry girder.

**Plate Girder:**

Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

**DRAWINGS:**

1. Structural drawings of various types of welded connections (simple and eccentric)
2. Beam to column connections (framed & seat connections)
3. Column bases- slab base, gusseted base and grillage foundation.
4. Plate girder.
5. Roof truss.

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**Text Books:**

1. Design of steel structures, A.S.Arya & J.L.Ajmani, Nem chand & Bros., Roorkee.
2. Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
3. Design of steel structures, S.M.A.Kazmi & S.K.Jindal, Prentice Hall, New Delhi.
4. Design of steel structures, S.K.Duggal, TMH Pub., New Delhi.

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# IRRIGATION ENGINEERING-I BT CE-602

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

## UNIT-I

### Introduction:

Irrigation-necessity, advantages, disadvantages, impact of irrigation on human environment , need and development of irrigation in India, crops and crop seasons, ideal cropping pattern and high yielding varieties of crops.

### Soil-water relationship and irrigation methods:

Soil-water relationship, root zone soil water, infiltration, consumptive use, field capacity, wilting point, available moisture in soil, GCA, CCA, intensity of irrigation, delta, base period, Kor depth, core period, frequency of irrigation, duty of water, relation between delta, duty and base period, irrigation requirement, flooding methods, border strip method, check basin and furrow method, assessment of irrigation water, sprinkler irrigation, favorable conditions, sprinkler systems, hydraulics of sprinkler irrigation, planning, design and maintenance of sprinkler systems, drip irrigation-components parts, advantages and limitations, suitability of drip irrigation.

## UNIT-II

### Canal irrigation:

Component of canal distribution system, alignment of channels, losses in irrigation channels, design discharge, silt theories and design of alluvial channels, comparison of Kennedy's and Lacey's theories, canal section and design procedure, Garrets and Lacey's diagrams.

## UNIT-III

### Water logging and land reclamation:

Water logging-effects, causes and measures of prevention, lining of irrigation channels, types of lining, design of lined channel land drainage, open drains, design considerations, advantages of tile drains, depth of tile drains, layout of closed drains, discharge and spacing of closed drains, diameter of tile drain, outlets for tile drains, maintenance of tile drains, purpose of land reclamation and methods of land reclamation.

## UNIT-IV

### River Training:

Classification of rivers, river training and its objectives, classification of river training works, methods of river training, marginal embankments, guidebanks, spurs, cutoffs, bank pitching and launching apron.

### Canal outlets:

Classification, requirements of a good outlet, design of pipe, APM and open flume outlet, flexibility proportionality, setting and sensitivity of outlet.

### Text Books:

- 1 Irrigation, Water Resources and Water Power Engg. by P.N.Modi.
- 2 Fundamentals on Irrigation Engg. by Bharat Singh.
- 3 Irrigation Engg & Hydraulic Structures by S.K.Garg.
- 4 Irrigation Engg. by S.K.Sharma.
- 5 Irrigation-Theory & Practice by A.M. Michael.

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# WATER SUPPLY & TREATMENT

BTCE-603

Total Credit: 43  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

## UNIT I

Water Sources: Definition and Scope of Environmental Engineering, Surface and ground water sources; Selection and development of sources;

Water Supply Systems: Municipal water demands and demand variations, Population forecasting and water demand estimations; Intakes and transmission systems, pipes for transporting water and their design

## UNIT II

Water Quality: Physical, chemical and biological water quality parameters; Water quality index; Water quality standards; Classification of water bodies.

Water treatment - I: Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units. Data and background information for the design of water supply system

## UNIT III

Water treatment - II: Fundamentals of water softening, fluoridation and defluoridation, and water desalinization and demineralization.

Design of Water Supply Systems: Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems

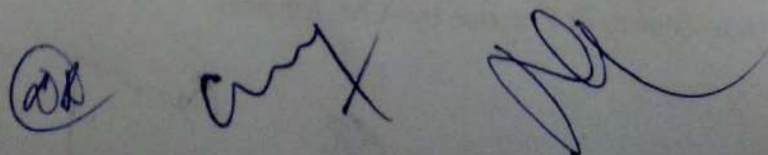
## UNIT IV

Pumps and pumping stations: Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; Pumping stations.

Small scale and household level water purification system and water fixtures

### **Text Books:**

1. Water Supply and Sewerage, McGhee, McGraw Hill.



3. Environmental Engineering, Vol. I, S.K. Garg, Khanna Publishers, New-Delhi
4. Environmental Engineering Peavy, Rowe and Tchobanglous, McGraw Hill.
5. Water and Waste Water Engineering (Vol. 1&2), Fair, Geyer & Okun, John Wiley, New York.
6. Water Supply Engineering P.N. Modi, Standard Book House New-Delhi.

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# GEOTECHNOLOGY-I

## BT CE-604

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

**Introduction to soil exploration:** scope, soil exploration for different structures, spacing, significant depth, boring and sampling techniques, types of samples, penetration test (DCPT and SPT), sample disturbances and Geophysical methods.

**Earth Pressure:** Earth Pressures at rest condition, states of plastic equilibrium, Rankine and Coulomb's theories for active and passive conditions, Influence of surcharge, water table, wall friction, open cuts, Retaining Walls.

### UNIT-II

#### Shallow Foundations-I

Design criteria for structural safety of foundation, location of footing, shear failure criterion, settlement criterion, ultimate bearing capacity, modes of shear failure, Rankine's analysis Terzaghi's theory, Skempton's formula, effect of fluctuation of G.W.T. , inclined load, I.S Code recommendations, factors affecting bearing capacity, methods of improving bearing capacity.

#### Shallow Foundations-II

Various causes of settlement of foundation, allowable bearing pressure based on settlement, settlement calculation, elastic and consolidation settlement, allowable settlement according to I.S.Code. Plate load test and its interpretation, bearing capacity from penetration tests, design bearing capacity.

Situation suitable for the shallow foundations, types of shallow foundations and their relative merits, depth of foundation, raft foundations, bearing capacity of raft in sands and clays.

### UNIT-III

#### Pile Foundations-I

Introduction, necessity of pile foundations, classification of piles, load capacity, static analysis, analysis of pile capacity in sands and clays, dynamic analysis, pile load tests, negative skin friction, uplift capacity of single pile, under-reamed pile.

#### Pile Foundations-II

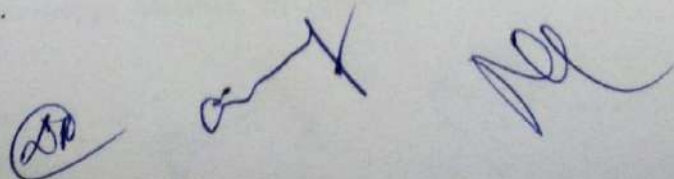
Group action in piles, pile spacing, pile group capacity, stress on lower strata, settlement analysis, design of pile caps, negative skin friction of pile group, uplift resistance of pile group, lateral resistance.

### UNIT-IV

**Stability of Slopes:** Infinite slope, types of failure, total and effective stress analysis, Taylor's stability numbers, concept of factors of safety, effect of sudden draw down and submergence.

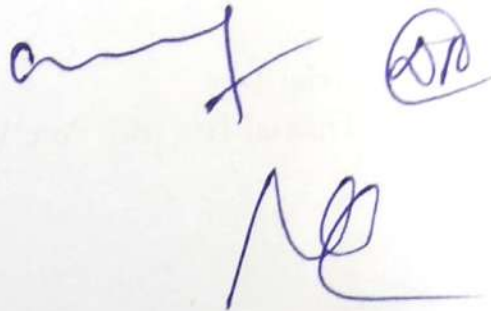
#### Drilled Piers and Caisson Foundations.

Introduction, components, shapes, stability of well foundation, Terzaghi's method of analysis, sinking of well, tilts and shifts.



## Text Books :

- 1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao. New Age Int.(P)Ltd..
- 2 Analysis and Design of Sub-Structures by Swamisaran, IBH & Oxford.
- 3 Principles of Foundation Engineering By B.M.das, PWS Kent, Boston.
- 4 Foundation Analysis & Design by J.E.Bowles, McGraw Hills.
- 5 Design Aids in Soil Mechanics & Foundation Engineering by S.R.Kaniraj, McGraw Hills.
- 6 Foundation Design by Teng, Prentice Hall, India.



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**GEOTECHNOLOGY (P)**  
**BT CE-605**

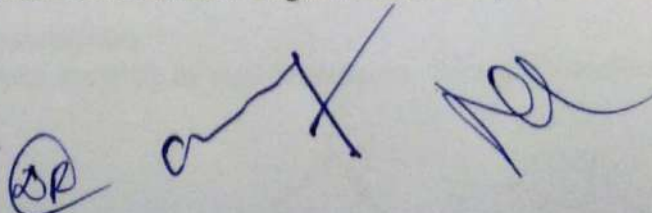
**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

1. Grain Size Analysis-Hydrometer method.
2. Shrinkage Limit Determination.
3. Relative Density of Granular Soils.
4. Consolidated Drained (CD) Triaxial Test.
5. Consolidated Undrained (CU) Triaxial Test with Pore Water Pressure measurement.
6. Consolidation Test.
7. Undisturbed Sampling.
8. Standard Penetration Test.
9. Dynamic Cone Penetration Test.
10. Model Plate Load Test.

**ENVIRONMENTAL ENGINEERING-I (P)**  
**BT CE-606**

**Total Credit: 1**  
**Max. Marks: 50**  
**External: 35**  
**Internal: 15**  
**Time Allowed: 3Hrs**

1. To determine the pH value of a given sample of water waste water.
1. To determine the turbidity in given water waste water sample.
2. To determine the acidity of given sample of water waste water.
3. To determine the alkalinity of given sample of water waste water.
4. To determine temporary and permanent hardness in a given water sample.
5. To determine the chlorine does required for a given water sample.
6. To determine total suspended, suspended, dissolved settable solids in a sewage sample.
7. To determine the chloride concentration in a given sample of waste water.
8. To determine the sulphate concentration in given water sample.

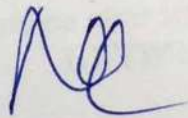


COMPUTER APPLICATION IN CIVIL ENGINEERING (P)  
BT CE-607

Total Credit: 1  
Max. Marks: 50  
External: 25  
Internal: 25  
Time Allowed: 3hrs

1. Computation of roots of a polynomial using.  
a) Bisection method, (b) Newton-Raphson method
2. Solution of linear simultaneous equation using Gauss Elimination / Gauss Jordan /  
Triangulation factorization method.
3. Solution of system of non-linear equation using fixed point / Newton Raphson / modified  
Newton-Raphson method.
4. Analysis of multi-span Beam and frames using stiffness matrix method.
5. Analysis of Plane frame and space Frame using automated software.
6. Analysis of a three storeyed and ten storeyed building using automated software.
7. Introduction to Auto CAD.

Students should be encouraged to write computer programs to solve different civil engineering problems.



**UNIT-I****Introduction, Permanent Way And Rails**

Rail transportation and its importance in India. Permanent way: requirements and components. Gauges in India and abroad. Selection of gauge. Coning of wheels. Adzing of sleepers. Rails: functions, composition of rail steel, types of rail sections, requirements of an ideal rail section, length of rails. Defects in rails. Creep of rails. Long welded rails and continuously welded rails.

**Sleepers, Fastenings and Ballast**

Sleepers: functions, requirements of an ideal sleeper. Types of sleepers: wooden, cast iron, steel and concrete sleepers, advantages, disadvantages and suitability of each type. Sleeper density. Fastenings for various types of sleepers: fish plates, spikes, bolts, bearing plates, keys, chairs, jaws, tie bars. Elastic fastenings. Ballast: functions, requirements, types of ballast and their suitability.

**UNIT-II****Points and Crossings**

Necessity. Turnout: various components, working principle. Switch: components, types. Crossing: components and types. Design elements of a turnout, design of a simple turnout. Layout plan of track junctions: crossovers, diamond crossing, single-double slips, throw switch, turn table, triangle.

**Signaling, Interlocking and Train Control**

Signals: objects, types and classification. Semaphore signal: components, working principle. Requirements / principles of a good interlocking system. Brief introduction to devices used in interlocking. Methods of control of train movements: absolute block system, automatic block system, centralized train control and automatic train control systems.

**UNIT-III****Geometric Design of the Track**

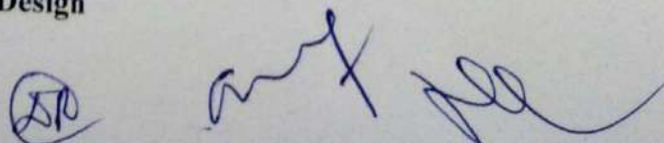
Gradients, grade compensation. Super elevation, cant deficiency, negative super elevation. Maximum permissible speed on curves. Tractive resistances, types. Hauling capacity of a locomotive.

**Stations, Yards and Track Maintenance**

Stations: functions and classification. Junction, non-junction and terminal stations. Yards: functions, types. Marshalling yard: functions, types. Maintenance of railway track: necessity, types of maintenance. Brief introduction to mechanized maintenance, M.S.P and D.T.M.

**UNIT-IV****Introduction and Airport Planning**

Air transportation, its importance and characteristics, status in India. Layout plan of an airport and its basic elements: terminal area, apron, taxiway, runway, hanger. Aircraft characteristics, their effect on elements of an airport. Site selection of an airport. Classification of airports.

**Runway Layout and Pavement Design**

Runway orientation, Wind Rose diagram. Basic runway length. Corrections to basic runway length. Runway patterns. Difference between highway and runway pavement. Types of runway pavements. Design factors for runway pavement. Brief introduction to design of thickness of a runway pavement.

**Text Books:**

- 1 A text book of Railway Engineering by S.C.Saxena and S.P.Arora, Dhanpat Rai Publications, N.Delhi.
- 2 Railway Track Engg. by J.S.Mundray, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.
- 3 Airport Planning and Design by S.K.Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
- 4 The Planning and Design of Airports by Robert Hornjeff, McGraw Hill Book Co.
- 5 Air Transportation Planning and Design by Virender Kumar & Satish Chandra, Galgotia Publications, N.Delhi.

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**GEOSYNTHETICS ENGINEERING**  
**BT CE 609**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT I**

**Basic Description of Geosynthetics:**

Historical Development, The Nomenclature, Function, Use around the World, Applications, Development in India.

Raw Materials – Their Durability and Ageing:

Raw Materials, Durability, Degrading Agencies, Polymers, Biological Resistance, Chemical Resistance, Weathering Resistance

**UNIT II**

**Manufacturing Methods:**

Fibres, Yarn, Nonwoven Geotextiles, Woven Geotextiles, D.S.F. Fabrics.

**Geogrids- Testing and Evaluation:**

Factors influencing Testing, Sampling, Physical Properties, and Mechanical Properties under Uniaxial loading, Creep Testing

**UNIT III**

**Erosion Control with Geogrids:**

Wind Erosion, Rain Water Erosion, Erosion Control Measures, Placement of Geogrid

**Bearing Capacity Improvement with Geogrids:**

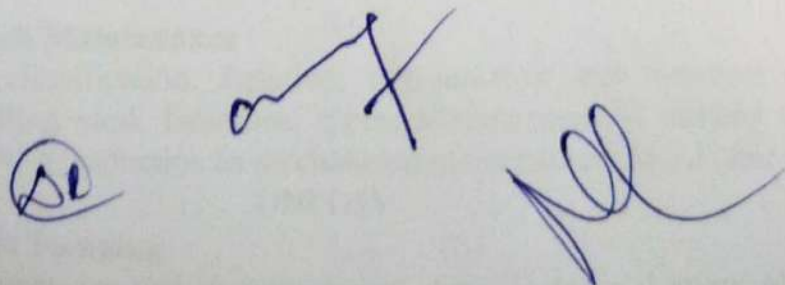
Advantages, Mechanism, Modes of Failure, Friction Coefficient, Experimental Studies.

**UNIT IV**

**Application of Geosynthetics in Water Resource Projects: Case Study:** Dharoidam, Hiran II Dam, Meda Creek Irrigation Scheme, Lining of Kakarpar Canal

**Text Books:**

- 1 Designing with Geosynthetics, (Prentice Hall ) by Robert M. Koerner.
- 2 Engineering with Geosynthetics, (Tata MacGraw Hill) by G.V. Rao & G.V.S. Raju



**ENVIRONMENTAL IMPACT ASSESSMENT**  
**BT CE 610**

**Total Credit: 4**  
**Max. Marks: 100**  
**Theory: 70**  
**Internal: 30**  
**Time Allowed: 3Hrs**

**UNIT I**

**Environment and Human Activity:**

Resources, pollution, reuse and environmental management

**Management of Aquatic Environment:**

Water quality controls, Drainage basin activities and water pollution. The impact of human activity on aquatic resources. The control measures, regional planning

**UNIT II**

**Air Quality Management:**

Atmosphere effect of human activity on air quality, waste disposal alternative, Optimization, planning of waste disposal.

**UNIT III**

**Waste Management:**

Water disposal methods, Impact of waste disposal of human activity.

**Land Use Management:**

Impact of land use on human life. Control of hazards in land use, management of land use.

**UNIT IV**

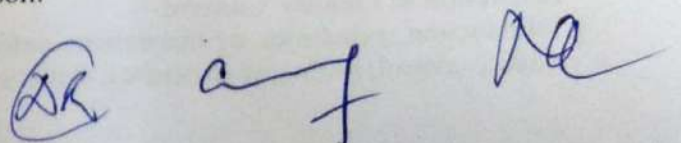
**Environmental Assessment:**

National environmental policy, implication of environment assessment in design process. Preparation of assessment, quantification. General requirements of environmental standards. Techniques of setting standards.

Case studies of EIA of river valley projects and thermal power projects.

**Text Books:**

- 1 Environmental Impact Analysis by R.K. Jail and L.V. Urban.
- 2 Environmental Impact Assessment by Canter.
- 3 Environmental Impact Assessment by J. Glasson.





List of DCEC

## PROJECT PLANNING & MANAGEMENT BT CE 611

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

#### Construction Management

Significance, objectives and functions of construction management, types of constructions, resources for construction industry, stages for construction, construction team, engineering drawings.

#### Construction Contracts & Specifications

Introduction, types of contracts, contract document, specifications, important conditions of contract, arbitration.

### UNIT-II

#### Construction Planning

Introduction, work breakdown structure, stages in planning-pre-tender stages, contract stage, scheduling, scheduling by bar charts, preparation of material, equipment, labour and finance schedule, limitation of bar charts, milestone charts.

#### Construction Organization

Principles of Organization, communication, leadership and human relations, types of Organizations, Organization for construction firm, site organization, temporary services, job layout.

### UNIT-III

#### Network Techniques in Construction Management-I: CPM

Introduction, network techniques, work break down, classification of activities, rules for developing networks, network development-logic of network, allocation of time to various activities, Fulkerson's rule for numbering events, network analysis, determination of project schedules, critical path, ladder construction, float in activities, shared float, updating, resources allocation, resources smoothing and resources leveling.

#### Network Techniques in Construction Management-II-PERT

Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem.

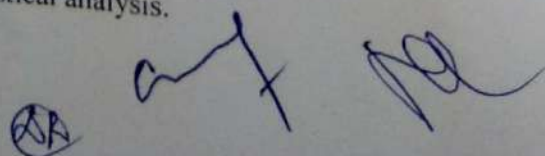
### UNIT-IV

#### Cost-Time Analysis

Cost versus time, direct cost, indirect cost, total project cost and optimum duration, contracting the network for cost optimization, steps in time cost optimization, illustrative examples.

#### Inspection & Quality Control

Introduction, principles of inspection, enforcement of specifications, stages in inspection and quality control, testing of structures, statistical analysis.



### Books Recommended

- 1 Construction Planning & Management by P.S.Gehlot & B.M.Dhir, Wiley Eastern Ltd.
- 2 PERT & CPM -Principles & Applications by L.S.Srinath. Affiliated East-westPress(P)Ltd.
- 3 Project Planning & Control with PERT & CPM by B.C.Punmia & K.K.Khandelwal,Lakshmi Pub. Delhi
- 4 Construction Management & Planning by B.sengupta & H.Guha, Tata McGraw

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# HYDRO ELECTRIC POWER DEVELOPMENT

## BT CE 612

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

**Introduction:**

Sources of power, estimation of water power, necessity and importance of harnessing small hydro power, flow duration and power duration curves, load curve, load factors, capacity factors, utilization factors, firm and secondary power.

**Types of Hydro Power Plants:**

Elements of Hydro power, classification of hydro-power plants, run-of-river plants, storage plants diversion canal development, pumped storage plants, tidal power plants, base load and peak load plants in a power grid.

### UNIT-II

**Intakes:**

Intake structures, functions and their types, components of intakes-forebay, trash racks, gates and valves, force required to operate gates.

**Conveyance System:**

Penstocks, design criterion, economical diameter anchor blocks, cradles and footings, water hammer, instantaneous closure of power canal, surge tank, surges in canals.

### UNIT-III

**Turbines:**

Types of turbines, specific speed and classification of turbines, synchronous speed, scroll casing, flumes and draft tubes, dimensions of scroll casing and draft tubes, setting of turbines

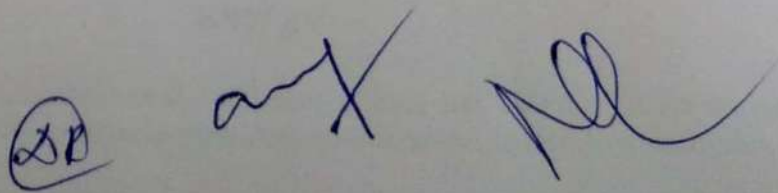
### UNIT-IV

**Power House:**

General layout and arrangements of hydro-power number and size of units, sub-structure, spacing of super-structure, underground power stations, tidal power.

**Text Books:**

- 1 Water Power Engineering, Dandekar, M.M. Sharma, K.N.
- 2 Hydro-Electric Engineering Practice Vol. I, II & III Brown
- 3 Water Power Engineering, Borrows, H.K.
- 4 Water Power Development, Vol. I & II, Mosonyi, E.
- 5 Water Power Engineering, M.M. Deshmukh



**RIVER MECHANICS & FLOOD CONTROL**  
**BT CE 613**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Introduction:**

Indian rivers, flood, flood problems, river morphology, behaviour of river flow, role of sediments in rivers, changes in regimes, river gauging, causes of flood and losses, alleviation of flooding.

**Hydrologic Statistics:**

Probabilistic treatment of hydrologic data, frequency & probability functions, statistical parameters, fitting a probability distribution, probability distribution for hydraulic variables.

**UNIT-II**

**Flood Mitigation by River Protection:**

Basis of river engineering, flow types, resistance flow, energy slope, backwater effect, three dimensional flow, circular and helicoidal flow, river improvement works, river survey, protection by embankment, discharge capacity, design of dyke, stability analysis of dykes, bank protection, bank recession, types of bank protection works, channel improvement, cutoffs diversion, bypass channel, cutoff channel, floored ways, flood plain zeroing, spreading grounds.

**UNIT-III**

**Flood Mitigation by Reservoirs:**

Design factors, storage capacity determinations, sequent peak algorithm method, live storage, ripple mass curve flood routing, flood storage, dead storage, reservoir classification, reservoir sedimentation, distribution of sediments in reservoirs, measurement of sediment yields, sediment load measurement, Mood's method, life of reservoir, reservoir operation based on annual storage and regulation, single and multi purpose reservoirs, gate operation schedule, maximum and minimum flow operation, multi purpose reservoir operation, reservoir economics-cost benefit ratios, optimisation of benefits.

**UNIT-IV**

**Flood Forecasting & Warning:**

Basic data, communication network, forecasting techniques and procedures, forecast of rainfall, runoff from rainfall, forecasting stages, peak travel time, forecast reporting flood warning, Engineering methods for flood fighting

**Engineering Economics of Flood Control:**

Estimation of flood damages, estimation of benefits of flood control, cost benefit analysis of flood control project.

**Text Books:**

- 1 Flood Control & Drainage Engg. by S.N.Ghosh.
- 2 Hydrology & Flood Control Engg. by S.K.Garg.
- 3 Hydrology & Water Resources Engg. by K.C.Patra

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**B.TECH (CIVIL ENGINEERING)  
VII SEMESTER**

**Transportation Engineering - II**  
**BT CE 701**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Design of Flexible Pavements:**

Types of pavements. Flexible and rigid pavements. Components of a pavement and their functions. Factors affecting design of pavements. Design of thickness of a flexible pavement by Group Index method, CBR method (including latest IRC guidelines), Triaxial method and Burmister's method.

**Design Of Rigid Pavements:**

Westergaard's theory, critical locations of loading, load and temperature stresses. Critical combination of stresses. IRC guidelines for determination of thickness of a rigid pavement. Joints: requirements, types, patterns. Spacing of expansion and contraction joints. Functions of dowel and tie bars.

**UNIT-II**

**Highway Construction : Non-Bituminous Pavements:**

Brief introduction to earthwork machinery: shovel, hoe, clamshell, dragline, bulldozers. Principles of field compaction of subgrade. Compacting equipments. Granular roads. Construction steps of WBM. WMM. Construction of cement concrete pavements. Slip-form pavers. Basic concepts of the following: soil stabilized roads, use of geo-synthetics, reinforced cement concrete pavements, prestress concrete pavements, roller compacted concrete pavements and fibre reinforced concrete pavements.

**Construction of Bituminous Pavements:**

Various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of BUSG, Premix carpet, BM, DBM and AC. Brief coverage of machinery for construction of bituminous roads: bitumen boiler, sprayer, pressure distributor, hot-mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various IRC and MOST specifications.

**UNIT-III**

**Highway Maintenance:**

Pavement failures. Maintenance operations. Maintenance of WBM, bituminous surfaces and cement concrete pavements. Pavement evaluation. Benkleman beam. Introduction to various types of overlays.

**Highway Drainage and Hill Roads:**

Surface drainage: types, brief design. Types of sub-surface drainage. Special characteristics of hill roads: geometrics, hair pin bends, construction of hill roads, drainage of hill roads, maintenance problems of hill roads

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## UNIT-IV

### Highway Economics and Finance

Need of economic evaluation. Highway user benefits and costs. Methods of economic evaluation: benefit cost ratio method, net present value method, internal rate of return method, comparison. Highway finance.

### Tunnels

Sections of tunnels: advantages, limitations and suitability of each section. Shaft. Pilot tunnel. Driving tunnel in rocks: sequence of construction operations, full face method, heading and bench method, drift method. Driving tunnels in soft ground: sequence of construction operations, needle beam method, shield tunneling, compressed air tunneling.

### Text Books

1. Highway Engg by S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.
2. Principles and Practice of Highway Engg. by L.R.Kadiyali, Khanna Publishers, Delhi.
3. Principles of Pavement Design by Yoder, E.J & Witzak, M.W., John Wiley and Sons, USA.
4. Tunnel Engineering by S.C.Saxena, Dhanpat Rai Publications, N.Delhi.
5. A text book of Tunnel, Bridges and Railway Engg. by S.P.Bindra, Dhanpat Rai Delhi.

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# SEWERAGE AND SEWAGE TREATMENT

## BT CE 702

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

#### Collection of sewage:

Importance of sanitation, Systems of sewerage – separate, combined and partially separate. Quantity of sanitary sewage and variations. Shapes of sewer – circular and egg shaped. Design of sewers, self-cleansing velocity and slopes, Construction and testing of sewer lines. Sewer materials, joints and appurtenances.

### UNIT-II

#### Sewage Characterization:

Quality parameters- BOD, COD, Solids, D.O., Oil & Grease. Indian Standards for disposal of effluents into inland surface sources and on land.

### UNIT-III

#### Sewage Treatment:

Objectives, sequence and efficiencies of conventional treatment units. Preliminary treatment, screening and grit removal units. Theory and design aspects of primary treatment, secondary treatment- activated sludge process & its modifications, Tricking filter, sludge digestion and drying beds.

Stabilization pond, aerated lagoon, UASB process, septic tank and Imhoff tank.

### UNIT-IV

#### Disposal of Sewage:

Disposal of sewage by dilution – self-purification of streams. Sewage disposal by irrigation (sewage treatment).

#### Text Books:

1. Waste Water Engineering: Metcalf and Eddy.
2. Sewage and Sewage Treatment: S.K. Garg.
3. Sewage and Sewage Treatment: S.R. Krishansagar.
4. Waste Water Engineering: B.C. Punmia.
5. Manual on Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.



**IRRIGATION ENGINEERING-II**  
**BT CE 713**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Regulation works:**

Canal falls-necessity and location, development of falls, design of cistern element, roughening devices, design of Sarda type fall, and design of straight Glacis fall. Off-take alignment, cross-regulator and distributory, head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes.

**UNIT-II**

**Cross drainage works:**

Classification and their selection, hydraulic design aspects of aqueducts, syphon aqueducts, super passage, canal syphon and level crossing, design of transitions.

**Diversion canal headworks:**

Various components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.

**UNIT-III**

**Storage Headworks:**

Types of dams, selection of a site, gravity dam-two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams-constant angle and constant radius arch dam, simple design and sketches, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters.

**UNIT-IV**

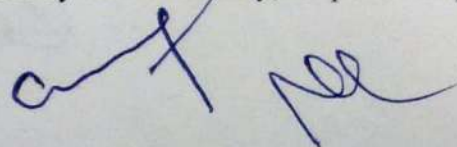
**Spillways and Energy Dissipaters:**

Essential requirements of spillway and spillway's capacity, types of spillways and their suitability, Ogee spillways, chute, side channel, shaft and syphon spillways, energy dissipation below spillways, stilling basins, USBR and I.S. Stilling Basins.

**Text Books:**

- 1 Irrigation, Water Resources and Water Power Engineering by P.N.Modi.
- 2 Fundamentals on Irrigation Engineering by Bharat Singh.
- 3 Irrigation Engineering and Hydraulic Structures by S.K.Garg.
- 4 Theory and Design of Irrigation Structures Vol.I & II by R.S.Varshney, Gupta & Gupta.

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**TRANSPORTATION ENGINEERING – II (P)**  
**BT CE 703**

Total Credit: 1  
Max. Marks: 50  
External: 35  
Internal: 15  
Time Allowed: 3Hrs

**LIST OF EXPERIMENTS**

1. Flakiness and Elongation Index of aggregates.
2. Specific gravity and water absorption test on aggregates.
3. Specific gravity of bitumen.
4. Proportioning of aggregates.
5. Marshall's stability test.
6. Stripping test on aggregates.
7. Determination of bitumen content.
8. CBR lab test on soil.
9. Traffic volume study using videography technique.
10. Traffic speed study using videography technique.

**ENVIRONMENTAL ENGINEERING-II (P)**  
**BT CE 704**

Total Credit: 1  
Max. Marks: 50  
External: 35  
Internal: 15  
Time Allowed: 3Hrs

1. To determine the acidity of a sewage sample.
2. To determine the alkalinity of a sewage sample.
3. To determine total, suspended, dissolved and settleable solids in a sewage sample.
4. To determine volatile and fixed solids in a sewage sample.
5. To determine oil and grease in a sewage sample.
6. To determine the chloride concentration in a sewage sample.
7. To determine the sulphate concentration in a sewage sample.
8. To determine the B.O.D. of a given sewage sample.
9. To determine the C.O.D. of a given sewage sample.
10. To determine the T.O.C. of a given sewage sample.
11. To determine the fecal count of a given sewage sample.
12. Microscopic studies of a sewage.

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## DCEC SUBJECTS

### DESIGN OF HYDRAULIC STRUCTURES BTCE-706

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

#### Unit-I

##### 1. Gravity Dams

Dam parameters, Criteria for selection of dam sites, Joints & keys, Cooling arrangement, Water stops at joints, Closing gaps, forces acting on dams, Types of loads, Elementary profile of a gravity dam, Step by step method, Stability analysis methods, Safety criteria, Gravity analysis, Internal stress calculations, Graphical determination of shear stress, Effect of foundation elasticity on stresses, Galleries, Behaviour of concrete gravity dam subjected to earthquakes, Thermal stresses.

#### Unit-II

##### 2. Arch Dams

Development of arch dam, Valleys suited for arch dams, Arch dams layout, Types of arch dams, Appurtenant works, Thin cylinder theory and most economical central angle, Design of arch dam, Suitability at abutments, Effects of foundation elasticity on the behaviours of arch dam.

##### 3. Buttress Dams

Types of buttress dam, Selection of type of buttress dam, Most economical profile having no tension, Design principles, Butterss design by Unit column theory, Basic shape of buttress, Design of multiple arch dam, Provision of spillways and outlet works.

#### Unit-III

##### 4. Spillways and Energy Dissipaters

Factors affecting design, Components of spillways, Types of spillways, Design principles. Hydraulic design ogee spillway, Side channel spillway, Chute spillway, Syphon spillway, Shaft-spillway, Energy dissipation below spillways, Bucket type energy dissipaters, Design of various types of stilling basins.

#### Unit-IV

##### 5. Weirs and Barrages

Design of weirs & barrages on permeable foundation, Khosla theory of independent variable, Upstream and downstream protection, Flownets, design of sloping Glacis weir, calculation for hydraulic jump and uplift pressure.

#### Text Books:

1. Engineering for Dams by Creager, Justin & Hinds, Wiley Eastern Pvt. Ltd. Delhi.
2. Concrete dams by R. S. Varshney, Oxford & IBH Pub. Co. Delhi.
3. Dams Part-1 gravity Dams by K. B. Khushalani, Oxford & IBH, Delhi.
4. Design of weirs on permeable foundations, CBIP Pub. No.20, Delhi.
5. Hydraulic Design of spillways, ASCE technical Engg. No.2, Design Guides as adapted from the US Army Corps.

**Industrial Waste Water Treatment**  
**BTCE-707**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

Effects of industrial wastes on streams, sewerage systems and wastewater treatment plants.

**UNIT-II**

Minimizing the effects of industrial effluents on waste water treatment plants and receiving streams-conservation of water, process change, reuse of waste water, volume reduction, strength reduction, neutralization, equalization and proportioning.

**UNIT-III**

Population equivalent. Industrial effluent standards for disposal into inland surface water sources and on land for irrigation.

**UNIT-IV**

Study of the following Industries from waste generation, quality and its treatment including brief overview of manufacturing process:

Textile, tannery, sugar mill, distillery, dairy, pulp & paper, metal plating, oil refinery, nitrogenous fertilizers, thermal power plants and radio active wastes.

**Text Books:**

1. Industrial and Hazardous Waste Treatment by N.L.Nemerow&A.Dasgupta.
2. Industrial Effluents by N.Manivasakam.
3. Waste Water Treatment by M.N.Rao&A.K.Dutta.

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**GROUND WATER HYDROLOGY**  
**BTCE-708**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

Properties of Aquifers, Formation constants, compressibility of aquifers, Equation of motion for steady and unsteady ground water flow in isotropic homogeneous aquifers, Dupit's assumptions. Unconfined flow with a recharge, tile drain problem. Ground water exploration and methods of investigations.

**UNIT-II**

Effect of boundaries, interference of water, leaky aquifers, Thiem's equilibrium formula for unconfined and confined aquifers and determination of hydraulic properties of aquifers. Partial penetration of an aquifer by a well, spherical flow in a well. Non equilibrium formula for aquifer (unsteady radial flows).

**UNIT-III**

Tubewells, optimum capacity, silting of tubewell, design of tubewells in different aquifers, tubewell types, parts, bore hole, strainers, its types, well pipe, casing pipe, blind pipe. Construction and working of tubewells, site selection, drilling operation, cable tool method, hydraulic method, rotary method and drilling fluids, well screen assembly installation, verticality and alignment of tubewells, gravel packing, development of tubewells, sickness, inconstruction and corrosion and failure of tubewells, Pumping equipment and hydraulic testing of pumps.

**UNIT-IV**

Artificial recharge of ground water, considerations and methods, recharge techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts and recharge wells.

**Books:**

1. Groundwater Hydrology, D.K.Todd, John Wiley & Sons Inc. New York.
2. Groundwater, H.M.Raghunath, Wiley Eastern Ltd., N. Delhi

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# GEOTECHNOLOGY-II

## BTCE-709

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

#### Earth Dams:

Introduction, types of sections, earth dam foundations, causes of failure and criteria for safe design, control of seepage through the embankment, control of seepage through the foundation, drainage of foundations, criterion for filter design. Introduction to rock fill dams.

#### Stability of slopes:

Causes of failure, factors of safety, stability analysis of slopes-total stress analysis, effective stress analysis, stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, effect of pore pressure, Fellenius method to locate center of most critical slip circle, friction circle method, Taylor's stability number, slope stability of earth dam during steady seepage, during sudden draw down and during and at the end of construction.

### UNIT-II

#### Braced Cuts:

Depth of unsupported vertical cut, sheeting and bracing for deep excavation, movements associated with sheeting and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.

#### Cofferdams:

Introduction, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock, inter-lock stresses.

### UNIT-III

#### Cantilever Sheet Piles:

Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method, simplified procedure, cantilever sheet pile, penetrating clay and limiting height of wall.

#### Anchored Bulkheads:

Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Blum's equivalent beam method.

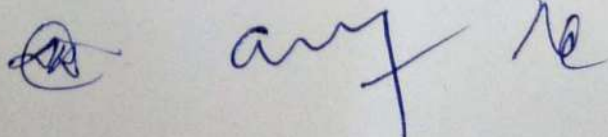
### UNIT-IV

#### Soil Stabilization:

Soil improvement, shallow compaction, mechanical treatment, use of admixtures, lime stabilization, cement stabilization, lime fly ash stabilization, dynamic compaction and consolidation, Bituminous stabilization, chemical stabilization, pre-compression, lime pile and column, stone column, grouting, reinforced earth.

#### Basics of Machine Foundations:

Terminology, characteristics elements of a vibratory systems, analysis of vibratory motions of a single degree freedom system-undamped free vibrations, undamped forced vibrations, criteria



for satisfactory action of a machine foundation, degrees of a freedom of a block foundation, Barken's soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

**Text Books:**

- 1 Analysis and Design of Foundation and Retaining Structures by S. Prakash, GopalRanjan&S.Saran, SaritaPrakashan.
- 2 Analysis and Design of Sub Structures by Swami Saran, IBH Oxford
- 3 Basic and Applied Soil Mechanics by GopalRanjan and ASR Rao, NewageInt.Pub.
- 4 Soil Dynamic by ShamshePrakash, McGraw Hill
- 5 Foundation Design by Teng, Prentice Hall
- 6 Soil Mechanics & Foundation Engineering by Bharat Singh, ShamshePrakash, Nem Chand & Bros, Roorkee.
- 7 Soil Mechanics and Foundation Engineering by Alam Singh



**BTCE-710**  
**ELEMENTS OF EARTHQUAKE ENGINEERING**

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

**UNIT-I**

**Seismology:**

Introduction, plate tectonics, earthquake distribution and mechanism, seismicity, seismic waves, earthquake magnitude and intensity, seismic zoning and seismometry.

**Single Degree of Freedom Systems:**

Various types of dynamic loads, vibration of single degree of freedom system, Free and forced vibrations, types of damping, critical damping, Transmissibility, vibration measuring instruments, response spectrum.

**UNIT-II**

**Multi-degrees of Freedom (MDOF) Systems:**

Equation of Motion, normal modes and natural frequencies, semi-definite systems, dynamic vibration absorbers, vibration dampers, principle of orthogonally, Stodolas method, Holzer's method, Matrix method, modal analysis and its limitations. Mode super position method.

**UNIT-III**

**Seismic Analysis and Design:**

General principles, assumptions, seismic coefficient method, response spectrum method, strength and deflection, design criterion for structures, significance of ductility, design and detailing for ductility, codal provisions, design examples.

**UNIT-IV**

**Seismic Performance, Repair and Strengthening:**

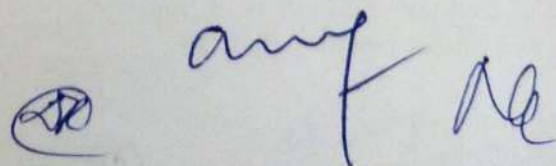
Methods for assessing seismic performance, influence of design ductility and masonry infills, criterion for repair and strengthening, repair and strengthening techniques and their applications, additions of new structural element

**Vibrational Control:**

General features of structural control, base isolation, active and passive control system. Earthquake resistance design as per I.S.: 1893, I.S. 4326 and I.S. 13920

**Text Books**

- 1 Elements of earthquake engineering and structural dynamics (3rd ed.) Hardcover – 2013 by André Filiatrault, Robert Tremblay, Constantin Christopoulos
- 2 Elements of Earthquake Engineering by Jai Krishna, Brijesh Chandra





## MACHINE FOUNDATIONS BTCE-711

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hrs

### UNIT-I

**Theory of Vibrations:**

Definitions, harmonic motion, vibrations of a single degree freedom system, transmissibility, theory of vibration measuring instruments.

**General Principles of Machine Foundation Design:**

Types of machines and machine foundations, criteria for satisfactory action of a machine foundation, permissible amplitude, allowable soil pressure, permissible stresses in concrete and steel, permissible stresses in timber.

### UNIT-II

**Evaluation of Parameters:**

Modes of vibration of a rigid block foundation, Barken's soil spring constants, determination of coefficients of elastic uniform compression and Elastic uniform shear.

**Foundations for Reciprocating Machines:**

Analysis of block foundation by Barken's theory of linear elastic weightless spring analogy, Indian Standard for design and construction of foundation for reciprocating machine, design procedure, design examples.

### UNIT-III

**Foundation for Impact Machines:**

Dynamic analysis, Barken's recommendations for weight and base contact area, IS Code practice for design and construction of foundations for impact machines, design procedure, design examples.

**Foundations for Rotary Machines:**

Special considerations, design criteria, methods of analysis and design.

### UNIT-IV

**Vibration Isolation and Screening:**

Active isolation, passive isolation, methods of isolation, wave screening, vibration absorbing materials, planning for vibration isolation.

**Text Books:**

1. Dynamics of Bases and Foundations by D.D.Barken
2. Soil Dynamics by ShamsheerPrakash
3. Soil Dynamics and Machine Foundations by Swami Saran
4. Principles of Soil Dynamics by B.M.Das
5. Vibration and Shock Isolation by Crede

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DESIGN OF STEEL STRUCTURES-II  
BT CE-712

Total Credit: 4  
Max. Marks: 100  
Theory: 70  
Internal: 30  
Time Allowed: 3Hr

UNIT-I

**Elementary Plastic Analysis and Design:**

Introduction, Scope of plastic analysis, ultimate load carrying capacity of tension members and compression members, flexural members, shape factor, mechanisms, plastic collapse, analysis, plastic analysis applied to steel beams and simple portal frames and design.

UNIT-II

**Design of Water Tanks:**

Introduction, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

**Design of Steel Stacks:**

Introduction, various loads to be considered for the design of steel stacks, design of steel stacks including foundation.

UNIT-III

**Towers:**

Transmission line towers, microwave towers, Design loads, classification, design procedure and specification.

**Cold Formed Sections:**

Introduction and brief description of various types of cold formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, design of compression and bending elements.

UNIT-IV

**Industrial Buildings:**

Loads, general arrangement and stability, design considerations, design of purlins, design of roof trusses, industrial building frames, bracings and stepped columns.

**Text Books:**

1. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem Chand & Bros., Roorkee.
2. Design of Steel Structures, P.Dayartnam, Wheeler Pub. Allahabad.
3. Design of Steel Structures, Gaylord & Gaylord, McGraw Hill, Newyork/International Students Edn., Toyo Kogakusha, Tokyo.
4. IS: 800-1984, Indian Standard Code of Practice for General Construction in Steel.
5. IS-801-1975, Indian Standard Code of Practice for Use of Cold formed light gauge steel structural members in general building construction.

