

**CENTRAL UNIVERSITY OF HARYANA
MAHENDARGARH**

**SCHEME OF STUDIES & EXAMINATIONS
B. Tech. in CIVIL ENGINEERING**

**Choice Based Credit System
(w.e.f. Session 2020-21)**

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B. Tech. 3rd YEAR (SEMESTER – V)

Scheme of Studies and Examinations

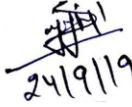
S. No.	Course No.	Course Title	Teaching Schedule			Credit
			L	T	P	
1	BT CE 501A	Structural Analysis-II	3	1	-	4
2	BT CE 502A	Design of Concrete Structures	3	0	-	3
3	BT CE 503A	Soil Mechanics	3	1	-	4
4	BT CE 504A	Environmental Engineering-I	3	0	-	3
5	BT CE 505A	Transportation-II	3	0	-	3
6	BT CE 506A	Design of Concrete Structures Lab	-	-	2	1
7	BT CE 507A	Soil Mechanics Lab	-	-	2	1
8	BT CE 508A	Environmental Engineering-I Lab	-	-	2	1
9	BT CE 509A	Summer Internship	-	2	-	2
	DECE I					
	BT CE 521A	Construction Technology & Management	3	0	-	3
	BT CE 522A	Construction Planning and Control	3	0	-	3
	BT CE 523A	Construction Contracts and Specifications	3	0	-	3
	BT CE 524A	Sustainable Construction Engineering	3	0	-	3
		Total	18	4	6	25

GEC (for other Department)

BT CE 342A	Building Construction	3	0	-	3
BT CE 542A	Hydropower Engineering	3	0	-	3

Note:

1. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including Cellular phones are not allowed in the examination.
3. Each student has to undergo Professional Training of at least 4 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carried out in the V semester.

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Central University of Haryana
Department of Civil Engineering
B. Tech. 3rd YEAR (SEMESTER – VI)
Scheme of Studies and Examinations

S. No.	Course No.	Course Title	Teaching Schedule			Credit
			L	T	P	
1	BT CE 601A	Concrete Technology	3	0	0	3
2	BT CE 602A	Hydrology and Water Resources	3	0	0	3
3	BT CE 603A	Design of Steel Structures	3	1	0	4
4	BT CE 604A	Environmental Engineering-II	3	0	0	3
5	BT CE 605A	Foundation Engineering	3	0	0	3
6	BT CE 606A	Concrete Lab	-	-	2	1
7	BT CE 607A	Environmental Engineering-II Lab	-	-	2	1
8	BT CE 608A	Foundation Engineering Lab	-	-	2	1
9	DCEC II & GEC					
	BT CE621A	Project Appraisal and Construction Finance	3	0	0	3
	BT CE622A	Construction Cost Analysis	3	0	0	3
	BT CE623A	Project Cost Analysis	3	0	0	3
	BT CE624A	Financial and Business Management	3	0	0	3
	Total		18	2	6	22

Note:

1. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including Cellular phones are not allowed in the examination.
3. Each student has to undergo Professional Training of at least 6 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carries out in the VII semester.



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STRUCTURAL ANALYSIS – II

Course Code: BT CE 501A

L	T	P	Credits
3	1	--	4

Course Outcomes

- CO1: Determine the Degree of Static and Degree of Kinematic Indeterminacy for any structure and ability to select suitable method for analysis.
- CO2: Perform analysis of indeterminate beams, frames by slope deflection method, moment distribution methods and approximate analysis for beams, frames and trusses.
- CO3: Create stiffness matrix and flexibility matrix and complete analysis by both methods
- CO4: Determine plastic strength of a section, plastic mechanisms, plastic analysis and its application

UNIT - I

Introduction: Introduction to matrix algebra, systems approach: force and displacement methods and their comparison. Relationship between force method and displacement method, Design examples

UNIT - II

Slope Deflection Method: Introduction, slope-deflection equations, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.

Moment Distribution Method: Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements, symmetrical beams and frames with symmetrical, skew-symmetrical and general loading.

UNIT - III

Kani's Method: Introduction, basic concept, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loadings and yielding of supports, symmetrical beams and frames, general case- storey columns unequal in height and bases fixed or hinged.

Approximate Analysis of Frame: Vertical and lateral load analysis of multistory frames, portal, cantilever and substitute-frame methods and their comparison.

UNIT - IV

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Space Frames: Introduction, simple space truss, types of supports, equilibrium and stability conditions, analysis of determinate and indeterminate space frames using tension coefficient method.

Plastic Analysis: Basics of plastic analysis, static and kinematic theorems for plastic analysis of beams and frames.

Suggested Readings

1. Bhavikatti, S. S. *Structural Analysis-II*. Vikas Publishing House, 2013.
2. Hibbeler, R.C. *Structural Analysis in S.I. Units*. 9th ed., Pearson Education, 2017.
3. Menon, D. *Structural Analysis*. Narosa Publishing House, 2009.
4. Ratwani, M.M. and Duggal S.K. *Analysis of Structures Vol. II*. Khanna Publisher, 1994.
5. Reddy, C.S. *Basic structural analysis*. Tata McGraw Hill Publisher, 2017.
6. Shyam, A. and Bhaskar, K. *Structural Analysis*. MedTech Publisher, 2019.
7. Thandavamoorthy, T. S. *Structural Analysis*. Oxford University Press, 2011
8. Wang, C.K. *Indeterminate Structural Analysis*. 1st Edition Tata McGraw Hill Publisher, 2017.

Note: Latest edition of books is to be referred.

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DESIGN OF CONCRETE STRUCTURES

Course Code: BT CE 502A

L	T	P	Credits
3	0	--	3

Course Outcomes

- CO1: Acquire knowledge of concepts of limit state method.
CO2: Develop knowledge for the design of concrete elements like beams, slabs and columns using IS codes 456, SP-16, & SP-34.
CO3: Design the reinforced concrete structures like isolated footings, combined footings etc
CO4: Design RCC structural elements.

UNIT-I

Design Philosophies: Working stress and limit state methods, IS 456:2000 code, Normal distribution curve, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress -strain relationship for concrete and steel.

Working Stress Design Method: Introduction, Assumptions, derivation of design constants, computation of moment of resistance, determination of stresses, and designs of singly and doubly reinforced rectangular and flanged beams in flexure, inverted flanged beams, and design examples.

UNIT-II

Limit State Design Method: Introduction, Limit States, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads. Limit State of Collapse (Flexure) Types of failures, assumptions for analysis and design of singly reinforced, doubly reinforced sections, and flanged sections and design examples

Design of Sections in shear, bond and torsion: shear reinforcement, Anchorage and flexural bond, development length, Torsional, stiffness, equivalent shear, Torsional reinforcement, Design examples.

UNIT-III

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.

Slabs: Introduction to one way and two-way slabs for distributed and concentrated load, non rectangular slabs. Design examples.

UNIT-IV

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Columns: Limit State of Collapse (Compression) Columns and their classification, reinforcement in columns, assumptions, short and long (both tied and helical) columns subjected to axial load, short columns subject to axial, uniaxial and biaxial bending.

Foundations: Isolated footings, combined footings, rectangular, trapezoidal, strip, strap, raft footings

Suggested Readings:

1. Chandra, R. *Limit State Design*. Standard Book House, 2018.
2. Ferguson, M. *Reinforced Concrete Fundamentals*. Revised ed., John Wiley and Sons, 1981.
3. Gambhir, M.L. *Reinforced Concrete Design*. Macmillan India Limited, 2006.
4. Jain, A.K. *Limit State Design of Reinforced Concrete*. 7th ed., Nem Chand Brothers, 2012.
5. Paulay, T. & Park, R. *Reinforced Concrete Structures*. John Wiley and Sons, 1975.
6. Pillai, S. & Menon, D. *Reinforced Concrete Design*. Tata McGraw Hill Publishers, 2017.

Note: Latest edition of books is to be referred.

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SOIL MECHANICS

Course Code: BT CE 503A

L	T	P	Credits
3	1	--	4

Course Outcomes

- CO1: Understand the soil classification and soil properties
- CO2: Evaluate permeability and compaction characteristics of soil mass and its application
- CO3: Evaluate consolidation properties of soil mass and its application in structures design
- CO4: Acquire knowledge on various theories & principles to analyze the response of soil under shear and earth pressure
- CO5: Understand the stability of slope and modes of failure

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 and 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 condition, critical hydraulic gradient, properties and utilities of flow net.

Permeability of Soils

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

UNIT-III

Compaction

Concept of Compaction, Water Content Density relationship, Zero Air Voids Line, Standard Proctor and Modified Proctor test, OMC, Placement Water Content, Field Compaction Control,

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Factors affecting compaction, Field Compaction Methods, Suitability of various compaction equipment.

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.

UNIT-IV

Vertical Stress below Applied Loads

Boussinesq Equations, its assumptions, Westergaard's formulae, Vertical Pressure under a uniformly loaded circular area, Vertical Pressure under Strip load, Vertical Pressure due to a Line Load, Newmark's Influence Chart.

Shear Strength

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, tri-axial 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.

Suggested Readings:

1. Arora, K.R. *Soil Mechanics and Foundation Engineering*. Standard Publishers, 2009.
2. Coduto, Donald P., William A. Kitch, and Man-chu Ronald Yeung. *Geotechnical Engineering- Principles and Practices*. Pearson Publications, 2017.
3. Craig, R. F. *Soil Mechanics*. Chapman and Hall, 2012.
4. Das, B.M. *Principles of Soil Mechanics*. PWS and Kent Publisher, USA.
5. Gulhati, S.K. and Dutta M. *Geotechnical Engineering*. McGraw Hill Education, 2017.
6. Murthy, V.N.S. *A text book on Soil Mechanics and Foundation Engineering*. CBS Publishers & Distributors, 2018.
7. Punmia, B. C., Ashok K. Jain, and Arun K. Jain. *Soil mechanics and foundations*. Laxmi Publication, 2017.
8. Raj, P. *Geotechnical Engg*. Tata McGraw Hill, 2013.
9. Ranjan G. & Rao, A.S.R. *Basic and Applied Soil mechanics*. New Age Publisher, 2016.

Note: Latest edition of books is to be referred.

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ENVIRONMENTAL ENGINEERING-I

Course Code: BTCE 504A:

L	T	P	Credits
3	0	--	3

Course Outcomes

- CO1: Understand the various components of water supply scheme and water demands
- CO2: Learn and analyze the relevant physical and chemical characteristics of water as per BIS
- CO3: Develop ability to design various components/units of water treatment plant
- CO4: Develop the understanding of objectives and methods of water disinfection

UNIT – I

Water Sources: Principal and Importance of water supplies, 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; Water borne diseases and their control.

Water treatment - I: Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure filter; Disinfection units.

UNIT – III

Water treatment - II: Fundamentals of water softening, fluoridation and defluoridation, and water desalinization and demineralization. Advanced treatments like adsorption, ion exchange, membrane processes.

Design of Water Supply Systems: Water distribution system service reservoirs; Methods of distribution and maintenance of water supply systems. Data and background information for the design of water supply system.

UNIT – IV

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

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Introduction to various types of home plumbing systems for water supply, Plumbing System in water Supplies, Small scale and household level water purification system, Various valves used in W/S systems.

Suggested Readings:

1. American Public Health Association, *Standard Methods for the Examination of Water and Waste Water*. 2017.
2. Fair, G. & Okun, John W. *Water and Waste Water Engineering (Vol. 1&2)*. John Wiley & Sons Publishers, 2010.
3. Garg, S.K. *Environmental Engineering. Vol. I*. Khanna Publishers, 1977.
4. Ministry of Urban Development, *Manual on Water Supply and Treatment*. 2005.
5. Modi, P.N. *Water Supply Engineering*. Standard Book House, 2017.
6. Peavy, Howard S., Rowe, Donald R. and Tchobanoglous, G. *Environmental Engineering*. McGraw Hill, 2017.

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TRANSPORTATION ENGINEERING – II

Course Code: BTCE 505A

L	T	P	Credits
3	0	-	3

Course Outcomes

- CO1. Analyze the necessity of construction of railway track, its components and properties
- CO2. Understand the geometrics of railway alignment and concepts associated to them
- CO3. Understand the importance of airport planning and site selection for all types of airports
- CO4. Design the runway and taxiway and understand the necessity of others airport amenities

UNIT –I

Introduction Permanent Way and Components: History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. Sleepers, Timber, steel, cast iron, concrete and pre-stressed concrete sleepers, sleeper density, ballast: material, specifications.

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards: Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning.

UNIT –III

Signaling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas.

UNIT – IV

Introduction to Airport Engineering Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment.

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Water Transport Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses. Inland waterways: advantages and disadvantages; Development in India, Inland water operation.

Reference Codes

1. Code of Practice for Planning and Design of Ports and Harbours (IS : 4651-1974)
2. Standards for Road-Rail Level Crossings (First Revision) 2015
3. Tentative Guidelines for the Design of Flexible Pavements (IRC : 037-2012)

Suggested Readings:

1. Aggrawal, M. M. *Railway Engineering Second Edition*. Oxford Publication, 2013.
2. Arora, S. P. & Saxena, S. C. *A Text Book of Railway Engineering*. Dhanpat Rai Publications, 2010.
3. Bindra, S.P. *A Course in Docs & Harbour Engineering*. Dhanpat Rai Publishing Company, 2012.
4. Khanna, S.K. Arora, M.G. & Jain, S.S. *Airport Planning & Design*. Nem Chand & Brothers, 1999.
5. Oza. *Docs & Harbour Engineering*. Charotar Publishing House, 2012.
6. Rangwala. *Airport Engineering*. Charotar Publishing House, 2018.
7. ---- *Docs & Harbour Engineering*. Charotar Publishing House, 2012.
8. ---- *Railway Engineering*. Charotar Publishing House, 2017.
9. Young, S. and Wells, A. *Airport Planning & Management*. McGraw-Hill Education- Seventh Edition, 2019.

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DESIGN OF CONCRETE STRUCTURES LAB

Course Code: BTCE 506A

L	T	P	Credits
-	-	2	1

Structural Drawings through AUTOCAD of the followings:

1. Singly reinforced concrete beams
2. Doubly reinforced concrete beams
3. Cracking pattern of reinforced concrete beams
4. Simply supported and cantilever slabs
5. Flat slabs
6. Two way slabs
7. Columns.
8. Footings.

Students are required to draw full length sheets on AUTOCAD and submit minimum 7 sheets during examinations.

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SOIL MECHANICS LAB
Course Code: BTCE 507A

L	T	P	Credits
-	-	2	1

List of Experiments:

1. Determination of water content of soil, by Oven Drying method.
2. Determination of water content of soil, by Pycnometer.
3. Determination of field density and dry unit weight by Core cutter method.
4. Determination of Specific Gravity of soil, by Pycnometer.
5. Determination of field density by Sand replacement method.
6. Grain size Analysis by Mechanical Method.
7. Grain size Analysis by Hydrometer Method.
8. Determination of Liquid Limit.
9. Determination of Plastic Limit.
10. Classification of a given soil sample based on the above determined properties.

Note:

- 1 At least 10 experiments are to be performed by students in the semester
- 2 At least 8 experiments should be performed from the above list, remaining two experiments may either be performed from the above list to be designed and set by Dept as per the scope of syllabus.

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ENVIRONMENTAL ENGINEERING-I LAB

Course Code: BTCE 508A

L	T	P	Credits
-	-	2	1

List of Experiments

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Suspended Solids
3. Alkalinity and acidity of water
4. Hardness of water: total hardness, calcium and magnesium hardness
5. Analysis of ions in water: Chloride
6. Analysis of ions in water: Sulfate
7. Optimum coagulant dose of water
8. Dissolved Oxygen (D.O) of water
9. Break point Chlorination, residual chlorine and chlorine dose of water.
10. Visit to a Water Treatment Plant

Note:

- 1 At least 10 experiments are to be performed by students in the semester
- 2 At least 8 experiments should be performed from the above list, remaining two experiments may either be performed from the above list to be designed and set by Dept as per the scope of syllabus.

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SUMMER INTERNSHIP

Course Code: BTCE 509A

L	T	P	Credits
-	-2	-	2

The students are required to undergo Industrial/Social Summer Internship in State/Central PWD, Railways and other Originations of duration not less than 4 week in a reputed organization or concerned institute after completion of 4th Semester. The industry chosen for undergoing the Internship should be at least a private limited company.

The viva-voce of the Industrial/Social Summer Internship will be conducted by an external examiner and one internal examiner appointed by the Institute. Assessment of Summer Internship will be based on seminar, viva-voce, report and certificate of Summer Internship obtained by the student from the industry or organization.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Course Code: BT CE 521A

L	T	P	Credits
3	0	--	3

Course Outcomes

CO1: Acquire knowledge on unique features of management of construction projects.

CO2 : Assimilate knowledge on basics of Construction project planning techniques

CO3: Acumen knowledge on network techniques in Construction Management

CO4: Develop concept of Time cost analysis, basics of inspection & quality and risk management in construction projects

CO5: Acquire knowledge usage of planning tools for construction project management

UNIT-I

Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution;

Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.

UNIT-II

Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks.

PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

UNIT-III

Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing,

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transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities

Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing;

Funds: Cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction

UNIT-IV

Project Monitoring & Control-Supervision, record keeping, periodic progress reports, and periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modeling (BIM) in project management;

Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

Suggested Readings:

1. Chudley, R. *Construction Technology*. ELBS Publishers, 2007.
2. Jha, Kumar Neeraj., *Construction Project management, Theory & Practice*. Pearson Education India, 2015.
3. *National Building Code*, Bureau of Indian Standards, New Delhi, 2017.
4. Nunnally, S.W. *Construction Methods and Management*. Prentice Hall, 2006.
5. Peurifoy, R.L. *Construction Planning, Methods and Equipment*. McGraw Hill, 2011.
6. Punmia, B.C. & Khandelwal, K.K. *Project Planning with PERT and CPM*. Laxmi Publications, 2016.
7. Varghese, P.C. *Building Construction*. Prentice Hall, 2007.

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CONSTRUCTION PLANNING AND CONTROL

Course code BT CE 522A

L	T	P	Credits
3	0	--	3

Course Outcomes:

- CO1. Acquire knowledge on CPM & PERT chart, material, manpower and equipment schedule
- CO2. Develop concept of manpower resources leveling and smoothing.
- CO3. Assimilate knowledge on Construction Management and Present Status of Construction Industry
- CO4. To understand Project management reporting documents.
- CO5. Acquire knowledge on frame a labour law for their project site.

UNIT I

Understanding Project Management, Project manager, Organization structures, Stages of Construction, organizing and staffing the project office and team

UNIT II

Construction Planning, Project planning, milestone schedules, WBS, Network techniques, CPM, PERT and Prima Vera, Line of Balancing Techniques, Critical Chain Method, Resources leveling and smoothing.

UNIT III

Project Management Information system, MIS reporting, Daily, Weekly and monthly reporting, Actual vs. Planned reporting, Planning & Cost control document, Quality and safety documents at site.

UNIT IV

Material management- purchases management and inventory control, ABC analysis. Management: Introduction for Management, History of Management theory, Leadership, Motivational Theories, Project controls. Construction Labour, Payment of wages Act, Workmen's Compensation Act, Minimum Wages Act.

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Suggested Readings:

1. Frank Harris & Ronald Mc Caffer, *Modern Construction Management*, Blackwell, 2013.
2. Jha, Kumar Neeraj., *Construction Project management, Theory & Practice*. Pearson Education India, 2015.
3. Harold Kerzner, *Project Management*, CBS Publisers & Distributors, 2006
4. K.K. Chitkara, *Construction Project Management*, McGraw Hill Publication, 2014
5. P G. Gahoit & B.M. Dhir, *Construction Management*, New age international (p) Ltd, 2018
6. Project Management, *Body of Knowledge*, PMI Global Standard, 2017
7. Punmia, B.C. & Khandelwal, K.K. *Project Planning with PERT and CPM*. Laxmi Publications, 2016.

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CONSTRUCTION CONTRACTS AND SPECIFICATIONS

Course Code: BT CE 523A

L	T	P	Credits
3	0	--	3

Course Outcomes:

- CO1: To analyze construction contract & agreements documents
- CO2: To understand evaluate and design construction specifications
- CO3: To understand knowledge on construction claims
- CO4 To analyse various laws and taxes on construction

UNIT I

Construction Contract: Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contract, terminology of contract. Construction Specifications: Standard specifications, general specification, development, interpretation. Tender and tender documents: Types of bidding, tender notice, tendering procedure.

UNIT II

Construction claims: Extra item, excess quantity, deficit quantity, price escalation. Dispute resolution mechanism: litigation, arbitration, conciliation, mediation, dispute resolution board. Contractual Problems: Possible contractual problems, creation of claims, development of disputes.

UNIT III

Contract document: Drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract. BOT contract: Types of contract, PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation.

UNIT IV

Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty. Relational Contract: Partnering, alliancing, key elements, processes.

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Suggested Readings:

1. C. J. Schexnayder and R. E. Mayo, *Construction Management Fundamentals*, McGraw Hill, 2003.
2. D.S. Berrie and B.C. Paulson, *Professional construction management including C.M., Design construct and general contracting*, McGraw Hill International, 1992
3. General Conditions of Contract, Central Public Works Department, New Delhi, 2010
4. S. Ranaga Rao, *Contract Management & Dispute Resolutions*, Engineering staff College of India, January 2008.
5. V. K. Raina, *Construction & Contract Management Practices*, SPD, New Delhi

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SUSTAINABLE CONSTRUCTION ENGINEERING

Course code BT CE 524A

L	T	P	Credits
3	0	--	3

Course Outcomes:

CO1. To create new engineering materials to improve the performance of infrastructure

CO2. To acquire knowledge on mitigate natural and man-made hazards

CO3. To understand fundamental knowledge of the inter-relationships between the built environment and natural systems.

CO4. To develop the technological innovations needed to safeguard, improve, and economize infrastructure and society.

UNIT I

Fundamentals of Sustainable Construction Engineering- Sustainability and resources, need, present practices at national and international level, The Sustainability Quadrant- challenges & Issues, Government initiatives.

UNIT II

Construction Product, Process Design and Development- Sustainability of construction resources, process modifications, product performance evaluation.

UNIT III

Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process. Socio-economic feasibility of sustainable construction products- Innovative & customized sustainable product design based on social constraints, tools & aids available for sustainable construction products.

UNIT IV

Life Cycle Assessment and Costing-Variou aspects related to construction cost, present value analysis, life cycle stages, cost calculation & measures, evaluation criteria, uncertainty assessment, sensitivity analysis, break even analysis.

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Suggested Readings:

1. Hagger *Sustainable Industrial Design and Waste Management*, Techniz Book 2010.
2. Jorge A. Vanegas, *Sustainable Engineering Practice* ASCE Publication 2010.
3. *LEED for India, Green Building Rating System* Reference Guide, 2011.
4. Rechberger Helmut, *Practical handbook of Material Flow Analysis*, Taylor & Francis. 2010.
5. Z. Michael. Hou, Heping Xie, Jeoungseok Yoon *Underground Storage of CO2 and Energy*, Taylor & Francis, 2010.

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CONCRETE TECHNOLOGY

Course Code: BT CE 601A

L	T	P	Credits
3	0	--	3

Course Outcomes

- CO1: Understand the behavior of fresh & hardened concrete
- CO2: Understand & design concrete mix using various design codes
- CO3: Identify the quality control & durability requirements of concrete
- CO4: Acquire knowledge of special concrete adopted in industries.
- CO5: Understand various non-destructive testing techniques & its application

UNIT – I

Constituents of Concrete: Properties of Cement, Tests on cement, Various types of cement & their applications, Bulking of Sand, properties of good sand and functions of sand in mortar and cement concrete, substitutes of sand, Classification of Aggregates, Properties of aggregates – specific gravity, bulk density, porosity, adsorption & moisture content of aggregates, deleterious substance in aggregate, Soundness of aggregate, Grading of coarse and fine aggregates, physical requirements of aggregates, and their tests, Admixtures: their purpose, their types, properties, dosages, effects and usages.

UNIT – II

Properties of Fresh and Hardened Concrete: Properties & Tests of Cement Concrete, Workability, factors affecting workability, measurement of workability by different tests; Strength of concrete and factors affecting it, Water Cement Ratio – Abram's law, Degree of Compaction and Age of Concrete. Development of Strength of Concrete, Methods of Curing, Influence of Temperature, Steam curing, Durability, shrinkage & Creep of Concrete, Factors influencing Creep; Compression tests and Tension Tests, Flexural Tests & Splitting Tests, Freeze and Thaw in Concrete.

UNIT – III

Concrete Mix Design: Principles of Concrete Mix Design, Basic Considerations, Factors in the choice of mix design, outline of mix design procedure, Proportioning of Concrete mixes by various methods – BIS Method of Mix Design, American Concrete Institute, British Standard, Quality control and Acceptance Criterion. Grades of Concrete, stress strain curve, permissible stresses

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UNIT – IV

Durability of Concrete: Sulphate attack of concrete, Corrosion of rebar wrt chloride and sulphate attack, Alkali Silica Reaction, Freezing and Thawing, Carbonation of Concrete, Corrosion Measurement Techniques, Prevention of Corrosion

Special Circumstances of Concreting: Hot weather concreting, Cold weather concreting, Underwater concreting, Heavy Concrete, Lightweight Concrete, Geopolymer concrete.

Suggested Readings:

1. Gambhir, M.L. *Concrete Technology*. Tata McGraw Hill, 2017.
2. *Handbook of Mix Design*. BIS, New Delhi. IS 10262 : 2009
3. IS Code on Ordinary Portland Cement IS:383 2016
4. IS Code of RCC, IS 456-2000
5. Neville, A. M. & Brooks, J.J. *Concrete Technology*. Pearson, 2019.
6. Santhakumar, A.R. *Concrete Technology*, Oxford University Press, 2006.
7. Shetty, M.S. *Concrete Technology*. S. Chand & Co., 2006.

Note: Latest edition of books is to be referred.

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HYDROLOGY AND WATER RESOURCES

Course Code: BT CE 602A

L	T	P	Credits
3	0	--	3

Course Outcomes

- CO1: Understand the hydrological cycle, precipitation, evapotranspiration and its estimation
CO2: Learn about the infiltration, runoff, hydrograph and design flood
CO3: Acquire knowledge on various irrigation system and soil-water relationship
CO4: Understand the concepts of canal irrigation and canal design
CO5: Design diversion head works and cross drainage works

UNIT-I

Hydrologic Cycle & Metrology: Hydrologic cycle, Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation, selection of rain gauge station. Hyetograph and mass curve of rainfall, Evaporation: Definition, factors affecting, measurement, evaporation control. Evapo-transpiration, Infiltration, W-Index and ϕ - Index

UNIT-II

Hydrograph: Discharge Hydrograph, component and factors affecting shape of hydrograph, Effective rainfall, Unit hydrograph and its derivation, unit hydrograph of different durations, UH- Instantaneous Hydrograph, UH-Synthetic, Floods Rational methods, Empirical formula, Flood frequency methods, Gumbels Method, Design Floods

UNIT-III

Soil-Water Relationship and Irrigation Methods: Soil-water relationship, root zone soil water, infiltration, consumptive use, field capacity, wilting point, available moisture in soil, Gross Command Area, Culturable Command Area, 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, Methods of Irrigation-flooding methods, border strip method, check basin and furrow method, assessment of irrigation water, sprinkler irrigation system.

UNIT-IV

Canal Irrigation & River Training Works: 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.

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

Suggested Readings:

1. Deodhar, M.J. *Elementary Engineering Hydrology*. Pearson Education, 2008.
2. Garg, S.K. *Irrigation Engg & Hydraulic Structures*. Khanna Publisher, 2013.
3. Garg, S. K. *Irrigation Engineering*. Khanna Publishers, 2008.
4. *Guidelines for Lining of Irrigation Canals*. Govt. of Odissa, Water Resources Department, 2019.
5. Michael, A.M. *Irrigation Theory and Practice*. 2nd ed., Vikas Publication House Pvt Ltd 2008.
6. Modi, P.N. *Irrigation, Water Resources and Water Power Engg*. Standard Book House, 2014.
7. Ojha, C.S.P. *Engineering Hydrology*. Oxford University Press, 2017.
8. Punmia, B. C., Ashok K. Jain, Arun K. Jain & Basi, Lal P.B. *Irrigation, and water power Engineering*. Standard Publisher, 2019.
9. Sharma, S.K. *Irrigation Engg*. S.Chand Publishers, 2017.
10. Singh, B. *Fundamentals on Irrigation Engg*. 6th ed., Nem Chand & Bros, 1979.
11. Subramanyam, K. *Engineering Hydrology*. Tata McGraw Hill, 2013.

Note: Latest edition of books is to be referred.

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DESIGN OF STEEL STRUCTURES-II

Course Code: BT CE 603A

L	T	P	Credits
3	1	--	4

Course Outcomes

CO1: Design of bolt and weld connections by using IS code

CO2: Design of tension and compression members by using IS code

CO3: Design of beams and beam columns by using IS code

CO4: Design of built up members and roof truss by using IS code

UNIT-I

Introduction: IS:800-2007- Steel Material specifications - Rolled sections – Section classifications - Permissible stresses in tension, compression, bending and shear.

Bolted Connection: Types of bolts - Resistance of bolted connections under various failure modes – design of beam splice, seated shear connections at the supports.

Welded Connection: Types - strength of welds - design of fillet and butt welds - shear and moment resistant joints - design and detailing of connections.

UNIT II

Tension Members: Types of failures- Strength of tension members- Design of Tension Members- Angle Section, Channel Section, Design- Block Shear Analysis., Design of Tension members subject to axial with bending.

Flexural Members: Design Criteria, permissible stresses, Rolled sections - built-up beams - Design for strength and serviceability, web crippling, web yielding, bearing stiffeners.

UNIT-III

Compression Members: Compression members, types of failures – Effective length, Slenderness ratio – Design - Simple and built- up sections - lacings and battens- design of eccentrically loaded compression members.

Column Bases: Introduction, types of column bases, design of Slab base and gusseted base, design of gusseted base subject to eccentrically loading.

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),

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Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

Suggested Readings:

1. Bhavikatti, S.S. *Design of Steel Structures: By Limit State Method*. 5th ed., I.K. International Publishing House, 2017.
2. Dayaratnam, P. *Design of Steel Structures*. S.Chand & Co., 2012.
3. Duggal, S.K. *Limit State Design of Steel Structures*. McGraw-Hill Book company, 2019.
4. *IS 800-2007, Code of practice for general construction in steel*. Bureau of Indian Standards, New Delhi.
5. Subramanian, N. *Design of Steel Structures (Limit State Design)*. Oxford University Press, 2016.

Note: Latest edition of books is to be referred.

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ENVIRONMENTAL ENGINEERING – II

Course Code: BT CE 604A

L	T	P	Credits
3	0	--	3

Course Outcomess

- CO1: Understand and design the various components of sewerage system
- CO2: Analyze the relevant physical and chemical characteristics of sewage
- CO3: Design various components/units of sewage treatment plant
- CO4: Understand objectives and methods of sewage disposal and sludge digestion

UNIT – I

Sewerage system: Generation and Estimation of Community Sewage; Flow variations; Storm Water flow; Alternate systems for sewage collection and conveyance; Design of sewers; operation and maintenance of sewers,

Characterization of sewage: Physical and Chemical Characteristics of Sewage; Sampling, testing and analysis of sewage; Relative stability and population equivalent.

UNIT – II

Treatment of sewage: Effluents standards; Basic principles of sewage treatment; Introduction to unit operations and processes - primary treatment units such as screening, grit chamber, and Sedimentation tanks. Secondary treatment units and tertiary treatment Sludge Handling and disposal – thickening, stabilization, dewatering, drying and disposal

UNIT – III

Sewage treatment units design: Secondary Treatment through Activated Sludge Process, TF, and Pollution due to improper disposal of sewage, Government authorities and their roles in sewerage disposal

Treated effluent disposal: Disposal into surface water bodies; Reuse for irrigation and aquaculturing; Land disposal; Disposal through injection into groundwater, Indian standards for disposal of effluent.

UNIT – IV

Low cost sanitation systems – Imhoff tanks, septic tank, stabilization ponds; oxidation ponds; and constructed wetland systems.

Pumping: Sewage pumping and pumping stations, Sewer connections for houses and buildings, Sewer appurtenances; Construction, testing and Maintenance of sewers.

Suggested Readings

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1. Fair, G. & Okun, John W. *Water and Waste Water Engineering (Vol. 1&2)*. John Wiley & Sons Publishers, 2010.
2. Garg, S.K. *Environmental Engineering Vol. I*. Khanna Publishers, 1977.
3. *Manual on Water Supply and Treatment*. Ministry of Urban Development, 2019.
4. Modi, P.N. *Water Supply Engineering*. Standard Book House, 2017.
5. Peavy, Howard S., Rowe, Donald R. and Tchobanoglous, G. *Environmental Engineering*. McGraw-Hill Book company, 2017.
6. Punmia, B. C., Ashok K. Jain, Arun K. Jain, *Waste Water Engineering*. Laxmi Publisher, 1998.
7. *Standard Methods for the Examination of Water and Waste Water*. American Public Health Association, 2017.

Note: Latest edition of books is to be referred.

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FOUNDATION ENGINEERING

Course Code: BT CE 605A

L	T	P	Credits
3	-	-	3

Course Outcomess

- CO1: Determine allowable bearing pressure and load carrying capabilities of shallow foundation system
- CO2: Evaluate the load carrying capacity of deep foundation (pile and well foundation)
- CO3: Understand the concept of machine foundation and have the knowledge of expansive soil
- CO4: Acquire knowledge of recent developments in Foundation Engineering.

UNIT I

Introduction to soil exploration: Scope, Methods of soil exploration, spacing, boring and sampling techniques, types of samples, sample disturbances, penetration tests (Standard Cone Penetration Test and Standard Penetration Test), and Geophysical methods (Seismic Refraction Method & Electrical Resistivity Method).

Earth Pressure: Earth Pressures at rest condition, states of plastic equilibrium, Rankine's theory for active and passive conditions, Influence of surcharge, water table, wall friction, Numerical Problems for the determination of Active and Passive Earth Pressure diagrams, Critical height of an Unsupported Vertical Cut.

UNIT II

Stability of Slopes: Infinite slopes, Critical Depth of a cohesive Infinite Slope, types of failure, Swedish Slip Circle Method, Taylor's stability Number and Stability Curves, Concept of factors of safety, Effect of sudden draw down and submergence.

Design of Shallow Foundation: Bearing Capacity, Definitions, depth of foundation, Terzaghi's general bearing capacity equation, IS code equation, factors affecting bearing capacity. Bearing capacity by penetration tests, Plate load test.

Design Criteria for Shallow Foundations, Stability, Shear, and Settlement Failures.

UNIT III

Pile Foundations: Types, function, selection of piles, pile driving formulae, point, bearing and friction piles. Load carrying capacity of single pile, group action, spacing of piles, Negative skin friction, Concept of under reamed piles.

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Caissons and Wells: Introduction, components, shapes, stability of well foundation, sinking of well, tilts and shifts.

UNIT IV

Drainage and Dewatering of Soil:

Methods of Ditches and Sump, Well Point System, Shallow Well System, Deep Well Drainage, Vacuum Method, Electro Osmosis Method, Protective Filters.

Soil stabilization and Geotextiles: Need and advantages of Ground Improvement techniques, Stabilization (Mechanical, Lime, Cement, bitumen, Chemical) of Soils and its advantages, Geotextiles (Concept, Types, Functions), Use of Geotextiles in Earth Dam Construction, Road Works, Railway works, Erosion Control and in Bearing capacity Improvement.

Suggested Readings:

1. Arora, K.R. *Soil Mechanics & Foundation Engineering*. Standard Publishers, 2009.
2. Bowles, J.E. *Foundation Analysis and Design*. McGraw Hill Book Company, 2017.
3. Coduto, Donald P. *Foundation Design-Principles and Practices*. Pearson Publications, 2014.
4. Liu, C. & Evett, J.B. *Soils and Foundations*. Prentice-Hall Inc., USA, 2017.
5. Murthy, V.N.S. *A text book on Soil Mechanics and Foundation Engineering*. CBS Publishers & Distributors, 2018.
6. Punmia, B. C., Ashok K. Jain, and Arun K. Jain. *Soil mechanics and foundations*. Laxmi Publication, 2017.
7. Rao, B.N.D. Narasinga *Soil Mechanics and Foundation Engineering*. WILEY, 2019.
8. Rao, G.R. & Rao, A.S.R. *Basic and Applied Soil Mechanics*. New Age International. (P) Ltd., 2016.

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CONCRETE Lab
Course Code: BT CE 606A

L	T	P	Credits
--	--	2	1

List of Experiments:

1. Determination of Fineness and Specific Gravity of cement.
2. Determination of consistency of standard Cement Paste.
3. Determination of initial and Final Setting times of Cement.
4. Determination of Compressive Strength of Cement.
5. Determination of Fineness modulus of Coarse and Fine Aggregates.
6. Determination of percentage of voids, Bulk density, Specific Gravity of coarse and Fine Aggregates.
7. Workability Tests: Slump Cone Test, Compaction factor test, Vee-Bee consistometer Test.
8. Preparing and curing concrete specimens for tests & Determination of compressive strength of concrete cubes.
9. Determination of tensile strength of concrete.
10. Determination of flexural strength of concrete.
11. Experiments to demonstrate the use of non-destructive test equipment.
12. Mix Design: IS Code method.

Note:

- 1 At least 10 experiments are to be performed by students in the semester
- 2 At least 8 experiments should be performed from the above list, remaining two experiments may either be performed from the above list to be designed and set by Dept as per the scope of syllabus.

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ENVIRONMENTAL ENGINEERING-II LAB

Course Code: BT CE 607A

L	T	P	Credits
-	-	2	1

List of Experiments

1. Physical Characterization of sewage water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of sewage water: Dissolved, Suspended Solids
3. Alkalinity and acidity of sewage water
4. Hardness of sewage water: total hardness, calcium and magnesium hardness
5. Analysis of ions in sewage water: Chloride
6. Analysis of ions in sewage water: Sulfate
7. Optimum coagulant dose of sewage water
8. Dissolved Oxygen (D.O) of sewage water
9. Break point Chlorination, residual chlorine and chlorine dose of sewage water
10. Visit to a Sewage Treatment Plant

Note:

- 1 At least 10 experiments are to be performed by students in the semester
- 2 At least 8 experiments should be performed from the above list, remaining two experiments may either be performed from the above list to be designed and set by Dept as per the scope of syllabus.

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FOUNDATION ENGINEERING LAB

Course Code: BT CE 608A

L	T	P	Credits
-	-	2	1

List of Experiments:

1. Determination of Permeability by constant head permeameter.
2. Determination of Permeability by variable head permeameter.
3. Determination of Specific Gravity of soil, by Density Bottle.
4. Determination of Compaction properties by Standard Proctor Test.
5. Determination of Compaction properties by Modified Proctor Test.
6. Determination of MDD and OMC at different compactive effort by compaction test.
7. Determination of relative density of sands.
8. Determination of shear strength, by Direct shear test.
9. Determination of shear strength, by Tri-axial shear test.
10. Determination of shear strength, by Unconfined Compression Test.
11. Determination of Bearing capacity by Standard Penetration Test.(Demonstration only)

Note:

- 1 At least 10 experiments are to be performed by students in the semester
- 2 At least 8 experiments should be performed from the above list, remaining two experiments may either be performed from the above list to be designed and set by Dept as per the scope of syllabus.

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ELECTIVE-I
PROJECT APPRAISAL AND CONSTRUCTION FINANCE
Course Code: BT CE 621A

L	T	P	Credits
3		--	3

Course Outcomes

CO1: Prepare Capital budgeting of a Construction site.

CO2: Prepare a Performance statement of a company

CO3: Estimate various financial instrumental such as IRR, Break even analysis

CO4: Prepare a Job Cost report of a Construction Site.

UNIT-I

Project Appraisal: Project appraisal, government and private project evaluators, significance of social benefit – cost analysis, commercial profitability, national economic profitability, measurement of direct and indirect benefit and costs. Calculation of benefit cost ratio.

UNIT-II

Engineering Economics: Time value of money, discounted cash flow, decision making among the alternatives, replacement analysis, break even analysis.

Project Capital: Cash flow of a project, estimation of minimum capital required, internal rate of return (IRR), Multiple IRR, estimation of annualized cost.

UNIT-III

Depreciation: Importance, classification, types, straight line, sum of year method, double rate declining balance method.

Capital Budgeting: Element of budgeting – men, materials, equipment, overhead, profits – preparation of capital budget.

UNIT-IV

Cost Control: Understanding control, operating cycles, cost account codes, Job cost report, Projected Cost Estimates, status reporting, variance and earned value.

Performance statement: Capital gearing ratio, shares, debentures, PBT, PAT, PBIT, Earning per share, preparation of company's performance statement, Inflation.

Suggested Readings:

1. Datta B.N. Estimating & Costing in Civil Engineering, UBS Publishers' Distributors Ltd, 2016.
2. Holm, L. *Cost Accounting and Financial Management for Project Managers*. Routledge, 2018.
3. Mueller, F.W. *Integrated Cost and Schedule Control for Construction Projects*. 2012.
4. Peurifoy, R.L. *Construction Planning, Methods and Equipment*. McGraw-Hill Book Company, 2011.
5. *Schedule of rates, specification manuals etc.* CPWD. 2018.

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6. Varghese, P.C. *Building Construction*. Prentice Hall India, 2007.

Note: Latest edition of books is to be referred.

ELECTIVE-II

CONSTRUCTION COST ANALYSIS

Course Code: BT CE 622A

L	T	P	Credits
3		--	3

Course Outcomes

CO1: Prepare a Job Cost report of a Construction Site.

CO2: Prepare a Financial statement of a company

CO3: Estimate various productivity components like labors, equipments and materials.

CO4: Prepare Capital budgeting of a Construction site.

UNIT-I

Project Cost Controlling: Development of Network, Development of Cost/Schedule Control System Criteria (C/SCSE), Monitoring of Project Cost, Cost Schedule Algorithms.

Cost Time Trade – off Analysis: Cost time trade – off curves, Non – convex discontinuous and discrete cost time trade – off curves, Crashing of projects, Heuristic methods, Siemen's method of project cost curve, Trade-off problems.

UNIT-II

Value Engineering: Principles of value engineering in Project Management, Value engineering technique, Job Plans, Life cycle costing and its applications.

Productivity in Construction: Definition of Productivity. Productivity measurements. Productivity of production components, Labors, Equipment and Material capital productivity. Planning, Designing and execution processes.

UNIT-III

Financial Statements: Financial statement analysis. Funds flow analysis leverages – operating. Financial and total cost volume profit analysis.

Budgeting and Financial Forecasting: Responsibility budgeting preparation of operating budget. Performance – budget analysis growth with internal equity. Sales forecast.

UNIT-IV

Working Capital Management: Working capital leverage. Analysis of working and capital components. Inventory management. Financing current assets. Regulation of Bank finance.

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Capital Budgeting: Tax considerations in investment appraisal, Payback period. Net present value method. Problems with internal rate of return method. Conflicts in ranking as per DCF criteria and their resolution. Capital budgeting under capital rationing and other constraints. Risk analysis of capital investments. Decision tree analysis. Applied utility theory. Cost of capital.

Suggested Readings:

1. Chitkara, K.K. *Construction Project Management*. Tata McGraw Hill Book Company, 1998.
2. Datta. *Material Management: Procedures, Text and Cases*, Prentice Hall, 2015.
3. Gobourne, J. *Site Cost Control in The Construction Industry*. Butterworth-Heinemann, 1982.
4. Gopalakrishanan, P. & Sundaresan, M. *Material Management- an Integrated Approach*. Prentice Hall, 2004.
5. Hendrickson C. and Tung A. *Project Management for Construction*. Prentice Hall, 1989.

Note: Latest edition of books is to be referred.

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ELECTIVE-III
PROJECT COST ANALYSIS
Course Code: BT CE 623A

L	T	P	Credits
3		--	3

Course Outcomes

CO1: Acquire the knowledge of different types of estimates for various civil works..

CO2: Understand the specification and measurements used in construction works.

CO3: Acquire Knowledge of Rate analysis and overhead charges.

CO4: Understand the various method of valuation of civil structure and property.

UNIT-I

Introduction Various types of Estimate, their relative importance. factors to be considered, complete set of Estimate. Approximate estimates: importance, purpose, different methods, CBRI Equations for the estimates. Methods of preparation of estimates for projects such as i) Building R.C.C. ii) Road iii) Irrigation and iv) Earthwork Calculations

UNIT-II

Specifications & Measurement Importance, types of specifications, detailed specifications for the buildings, roads and minor bridges, Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, Bar bending schedules, measurement book.

UNIT-III

Rate Analysis & Accounts Purpose of Rate analysis, importance and necessity, factors affecting, task work, daily output of various resources, Rate analysis for various Items, overhead charges, contingencies and work charge establishment, various percentages for different services in building, percentage breakup of the cost, market survey of basic materials, cash book, materials at site account, imprest account, tools, various types of running bills, secured advance, final bill.

UNIT-IV

Valuation Different terms used, the role of a valuer, purpose and necessity of the same. Capitalised Value, Years purchase, sinking fund, depreciation, types of values, Purpose of valuation Different methods of valuation for open plots, open plots with existing residential & commercial structures iii. lease hold properties. Use of valuation tables and formulae.

Suggested Readings:

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1. Chakravarty, M. *Estimating, Costing Specifications & Valuation*, MK Publishers, 2010.
2. CPWD - *Schedule of Rates (2018)*,
3. Works Manual, 2019.
4. Datta B.N. *Estimating & Costing in Civil Engineering*, UBS Publishers' Distributors Ltd, 2016.
5. Joy P.K. *Handbook of Construction Management*, Macmillan Edition, 2015.
6. Patil, B.S. & Woolhouse S.P. *Building & Engineering Contracts*. CRC Press Taylor & Francis Group, 2019.

Note: Latest edition of books is to be referred.

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ELECTIVE-IV
FINANCIAL AND BUSINESS MANAGEMENT
Course Code: BT CE 624A

L	T	P	Credits
3		--	3

Course Outcomes

CO1: Identify the role and responsibility of Project manager.

CO2: Understand the business policies and strategic management.

CO3: Attain knowledge of Financial Management and Capital budgeting.

CO4: Prepare business plan by analyzing the economic and market situations.

UNIT-I

Principles of management and Personnel management: Economic environment of business, Introduction to managerial economics, Role of a Manager: Tasks and responsibilities of a professional manager, Human Resource development systems Organization structure & design, manpower planning Processes Managerial skills and Management Systems, techniques and processes, SWOT Analysis.

UNIT-II

Business Policy and Strategic Management: Assessment of capital requirement and sources of capital planning the establishment and development of business, fixed and current assets, liquid resources, Forecasting of business, cash flow, effect of taxation, Public and private sources of finance, methods of obtaining finance from external sources and internal sources, cost of capital, forms of capital structures.

UNIT-III

Value engineering and quality assurance: marketing planning & organization, marketing research & Marketing strategies, determinants of consumer behaviour, Models of consumer behaviour, Pricing & promotion strategies., Business forecasting. Modern Control Systems, Total quality Management (TQM), JIT, DSS, ERP, Strategic Management, Technological innovation & creativity.

Financial Management: Meaning and Scope, Economics and Scope, Supply and Demand Mechanism, analysis and forecasting. balance sheet, profit & loss account, fund flow statement; Production and Cost theory, analysis. Pricing; objectives, determinants, absorption, marginal costing. Financial analysis, Decisions. Capital Budgeting, budgetary control, standard costing and variance, investment appraisal.

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UNIT-IV

Construction Finance: Accounting information and application, Financial versus economic evaluation, financial statements and project appraisal. Project yield, taxation and inflation, risk and uncertainty, Turnkey activities; finance and working capital, depreciation and amortization; cost control, performance budgeting, equipment rentals. Bidding and awards, work pricing, cost elements of contracts, letters of credit, financing plans, multiple sources of finance. Qualifying, bidding, bidders, comparing the bids, under-writing, unforeseen revisions, costs and rates escalation, cost progress reporting. Legal aspects.

Suggested Readings:

1. Anthony, R.N., Govindrajana, V., Irwin, *Management control systems*, McGraw Hill Book Company, 2000.
2. Baumel, W.J., A.S. Blinder and W.M. Scarth, *Economics: Principles and policy*, Academic Press 1985.
3. Parkin, M. & Bade R., *Modern Macroeconomics*, Prentice Hall, 1996.
4. Peterson, H.C. & Lewis, W.C. *Managerial Economics*, Prentice Hall., 2001.
5. Simon A. Burtonshaw-Gunn, *Risk and Financial Management in Construction Industry*, Routledge Publishing House, 2016
6. Werther & Davis, *Human Resources & Personnel Management*, McGraw Hill, 1996.

Note: Latest edition of books is to be referred.

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BUILDING CONSTRUCTION

Course code : BT CE-342A

L	T	P	Credits
3	1	--	4

UNIT I

Foundation: Preliminary investigation of soil, Safe bearing capacity of soil, Function and requirements of good foundation, Types of foundation, Introduction to Spread, Combined, Strap, Mat and Pile foundation.

Masonry: Definition and terms used in Masonry. Brick masonry, Characteristics and Requirements of good brick masonry, Bonds in brick work, Header, Stretcher, English, Flemish bond, Types of walls; Load bearing, Partition walls, Cavity walls.

UNIT II

Formwork & Scaffolding: Function of forms, Form Erection, Oiling and Stripping of Form, Requirement of Form work and Materials used for various Civil Engineering Structures, Scaffolding, Shoring, Under pinning & Strutting, Types, Purposes & Precautions.

Building finishes: Objectives & Processes, Pointing, Plastering & Painting, White wash & Colour wash, Distempering etc, on old & new surfaces, repairs & maintenance. R.C.C. framed structure, column, beam, footing, slab & their connections.

UNIT III

Doors and Windows: Location of doors and windows, technical terms, Sizes as per IS recommendations, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window, Ventilators.
Types of staircase, Lifts & Escalators used for Vertical Circulation.

Damp-Proofing and Water-Proofing: Defects and Causes of Dampness, Prevention of Dampness, Materials used for dampness, Damp-Proofing treatment in Foundation and Buildings, Water Proofing treatment of Roofs including pitched roofs.

UNIT IV

Floors: Requirement of Good Floor, Selection of Flooring Material, Laying of Concrete, Mosaic, Marble, Granite, Tile flooring,

Roofs: Requirement of good roof, Types of roof, R.C.C. Roof Pitched roof, Trussed roof, King post Truss, Queen Post Truss

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Sound Insulation and Fire Protection: Measurement and transmission of Sound, Sound Absorber, Sound insulation of Buildings, Fire Resistant Construction and Fire Protection requirements for Buildings, Types of Fire Extinguishers

Suggested Readings:

1. Punima B. C., *Building Construction*, Laxmi Publisher House ,2016
2. Goyal M.M., *Handbook of Building Construction*, Amrindia Consultancy, 2013
3. Khanna P. N., *Indian Practical Civil Engg. Handbook*, Engineers Publishers , 2012
4. Arya S., *Masonry & Timber structures including Earthquake Resistant Design*, Nem Chand & Bros., 2010
5. Duggal S. K., *Building Construction*, New Age Publishers, 2019
6. Kumar Sushil, *Building Construction*, Standard Publisher and Distributors, 2014

This subject to be offered by Civil Engineering department for other departments students as GEC subject for 3rd & 4th Semester students

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HYDROPOWER ENGINEERING

Course code: BT CE 542A

L	T	P/D	Total
3	1	-	4

Course Outcomes

- CO1: Estimate hydropower potential
- CO2: Understand the different types of hydropower plants
- CO3: Acquire knowledge on the design penstocks and surge shaft
- CO4: Acquire the knowledge of the components of a hydropower plant

UNIT-I

Introduction: Sources of Power, Estimation of Water Power, Method of Computing Hydrographs, Mass Curves, Flow Duration Curve & Power Duration Curves, Load curve, Load factors, Capacity Factors, Utilization Factors, Firm and Secondary Power, Necessity and importance of Harnessing Small Hydro 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, Purpose and General Layout of Pumped Storage Plants, Types, Typical arrangements of the Upper Reservoirs, Economics of Pumped Storage Plants, Tidal Power Plants, Base load and Peak load plants in a Power Grid.

UNIT-II

Intakes: Intake structures, Dams, 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: Functions and behaviour of the Surge Tanks, Location, Types of Surge Tanks, Basic Design Criteria of Simple Surge Tank, Forebay, Water hammer and surge tanks: Rigid and elastic water column theories, water hammer pressure. Behavior of surge tanks, types of surge tanks, hydraulic design, design of simple surge tank-stability

UNIT -III

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Turbines: Hydraulic Turbines and Types and Classification, Constructional features, Hydraulic Analysis, selection, Characteristic Curves, Governing of Turbine, Drafts Tubes types, Hydraulic Principles, and Design, Gates and Valves types, Design of Air Vent

UNIT-IV

Power House: General Layout and arrangements of Hydro-Power units, Number and Size of Units, Sub-Structure, Spacing of units, Super-structure, Underground Power stations, Tidal power.

Suggested Readings:

- 1 Brown J.G., *Hydro-Electric Engineering Practice Vol.I,II & III*, Blackie and Sons Limited, 1984
- 2 Breeze Paul, *Hydro Power*, A P Publisher, 2018
- 3 Dandekar, M.M., Sharma,K.N., *Water Power Engineering*, Vikas Publishing House, 2013.
- 4 Darde P N, *Hydro Power Engineering*, Vayu Education, Delhi, 2017
- 5 Edwin Parks, *Hydro Power Engineering*, Larsen and Keller Education, 2019
- 6 Mosonyi E, *Water Power Development*, Vol. I & II,. Nem Chand & Bros; 2009

Note: Latest Edition of Books is to be taken.

This subject is to be offered by Civil Engineering department for other departments students as GEC subject for 5th & 6th Semester students

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