

Uttarakhand Technical University, Dehradun
Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus for B. Tech Third Year

W.E.F. Academic Session 2020-21
V & VI SEMESTER



Bachelor of Technology (B. Tech.)

[Civil Engineering]

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula

Bachelor of Technology (B.Tech.) III Year

[Civil Engineering]

W.E.F. Academic Session 2020-21

V Semester

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credit
				Theory			Practical			L	T	P	
				End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional					
1.	CE 501	DC	Fluid Mechanics II	100	30	20	30	20	200	3	0	2	4
2.	CE-502	DC	Transportation Engg II	100	30	20	30	20	200	2	1	2	4
3.	CE-503	DE	Departmental Elective	100	30	20	-	-	150	3	1	0	4
4.	CE-504	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	CE-505	D Lab	Quantity Surveying & Costing	-	-	-	30	20	50	0	1	3	2
6.	CE-506	O/E Lab	Material Testing Lab				30	20	50	0	1	2	2
7	CE-507	IN	Evaluation of Internship-II completed at II year level	-	-	-	-	100	100			4	2
8	CE-508	P	Field Visit, Case Study and Seminar/ Minor Project-I	-	-	-		100	100	0	0	6	3
9		IN	Internship -III	To be completed any time during Fifth/ Sixth semester. Its evaluation/credit to be added in Seventh semester.									
Total				400	120	80	120	280	1000	11	5	19	25
NSS/NCC													

Departmental Electives		Open Electives	
CE 503(A)	Structural Analysis-II	CE-504(A)	Urban and Town Planning
CE 503(B)	Construction Planning and Management	CE-504(B)	Remote sensing and GIS
CE 503(C)	Quantity Surveying and Costing	CE-504(C)	Renewable Energy Resources
CE 503(D)	Marine Construction	CE 504(D)	Innovations and Entrepreneurship

VI Semester

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credit
				Theory			Practical			L	T	P	
				End Sem	Mid Sem	Quiz / Assignment	End Sem	Team Work / Lab Work & Sessional					
1.	CE 601	DC	Structural Design and Drawing (RCC-I)	100	30	20	30	20	200	3	1	2	5
2.	CE-602	DC	Environmental Engineering	100	30	20	30	20	200	3	1	2	5
3.	CE-603	DC	Design of Steel Elements	100	30	20	30	20	200	2	1	2	4
4.	CE-604	DE	Departmental Elective	100	30	20		-	150	3	1	0	4
5.	CE-605	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
6.	CE-606	O/E Lab	OE Lab/ Advance Surveying Lab	-	-	-	30	20	50	0	0	4	2
7	CE-607	P	Minor Project –II					50	50	0	0	4	2
		IN	Internship – III	During 5/6 semester									
Total				500	150	100	120	130	1000	14	5	14	26

Note: Meaning of Last Character of Subject Code (T – Theory; P – Practical)

Departmental Electives		Open Electives	
CE 603(A)	Water Resource Engineering	CE-604(A)	Operations Research
CE 603(B)	Precast and Modular Construction	CE-604(B)	Environmental Impact Assessment
CE 603(C)	Cost Effective and Eco Friendly Structures	CE-604(C)	Advance Pavement Design

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Civil Engineering, V-Semester
CE 501 Fluid Mech. – II

Unit-I

Turbulent flow : Laminar and turbulent boundary layers and laminar sublayer, hydrodynamically smooth and rough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes. Pipe flow problems : Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Pipe Network : *Water Hammer (only quick closure case). transmission of power. *Hardy Cross Method

Unit-II

Uniform flow in open channels : Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Venet equation.

Unit-III

Non uniform flow in open channels : Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit-IV

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Unit-V

Fluid Machines: Turbines : Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation. Pumps: Centrifugal pumps : Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves. Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

Reference books:-

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi
2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., Delhi
3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Mechanics - K.R. Arora - Standard Publishers Distributors 1705- B, Nai Sarak, Delhi-6
5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics By H. Rouse
8. Centrifugal & Axial Flow Pump By Stemanoff A.J. New York
9. Relevant IS codes.

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Civil Engineering, V-Semester
CE 502 - Transportation Engineering- II

Unit - I

High way planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location.

Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.

Unit – II

Bituminous & Cement Concrete Payments: Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars. Brief study of recent developments in cements concrete pavement design, fatigue and reliability.

Unit – III

Low Cost Roads, Drainage of Roads, Traffic Engg. & Transportation Planning: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads-types, specifications, construction, maintenance and causes of failures.

Surface and sub-surface drainage, highway materials: properties and testing etc. Channelised and unchannelised intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.

Unit - IV

Airport Planning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, windrose diagrams, basic runway length and corrections, classification of airports.

Geometrical elements: taxi ways and runways, pattern of runway capacity.

Unit - V

Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface-imaginary, conical, and horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental landing system, precision approach radar, VOR enroute traffic control.

Reference Books:

1. Highway Engineering by Gurucharan Singh
2. Highway Engineering by S.K. Khanna & C.E.G. Justo
3. Highway Engineering by O’Fleherly
4. Sharma & Sharma, Principles and Practice of Highway Engg.
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Haung, Analysis and Design of Pavements
7. Horonjeff Robert “The Planning & Design of Airports”
8. Highway Material by Walker

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Civil Engineering, V-Semester
Departmental Elective CE- 503 (A) Structural analysis-II

Unit. I

Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Unit. II

Plastic analysis of beams and frames.

Unit. III

Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Unit. IV

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

Unit. V

Influence lines for intermediate structures, Muller Breslau principle.

Reference Books :-

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
3. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
4. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.
5. Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi

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Civil Engineering, V-Semester

Departmental Elective CE- 503 (B) Construction Planning & Management

Unit -I

Preliminary and detailed investigation methods: Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

Unit -II

Construction equipment: Factors affecting selection, investment and operating cost, output of various equipment, brief study of equipment required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Unit -III

Contracts: Different types of controls, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Unit -IV

Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

Unit-V

Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line models with their applications, shovel truck performance with waiting line method.

Reference Books:-

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

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Civil Engineering, V-Semester
Departmental Elective CE- 503 (C) Quantity surveying & Costing

Unit – I

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

Unit – II

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

Unit – III

Detailed Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

Unit – IV

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR.

Unit – V

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

Reference Books:-

1. Quantity Surveying & Costing – B.N. Datta
2. Estimating & Costing for Civil Engg. – G.S. Birdi
3. Quantity surveying & costing – Chakraborty
4. Estimating & Costing – S.C. Rangawala

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Civil Engineering, V-Semester
Departmental Elective CE- 503 (D) Marine Construction

Unit – I

History of water transportation at world level and at national level development and policy, classification of harbours, natural and artificial. Major ports in India, administrative set up. 2.

Unit – II

Harbour Planning: Harbour components, ship characteristics, characteristics of good harbour and principles of harbour planning, size of harbour, site selection criteria and layout of harbours. Surveys to be carried out for harbor planning

Unit – III

Natural Phenomena: Wind, waves, tides formation and currents phenomena, their generation characteristics and effects on marine structures, silting, erosion and littoral drift.

Unit – IV

Marine Structures: General design aspects, breakwaters -function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories – function, types, suitability, design and construction features.

Unit – V

Docks and Locks: Tidal basin, wet docks-purpose, design consideration, operation of lock gates and passage, repair docks -graving docks, floating docks.

References books: –

1. A course in docks and harbours: S. P. BINDRA
2. Harbour docks and tunnelling: R. SRINIVASAN
3. Doc and harbour engineering: OZA

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Civil Engineering, V-Semester
Open Elective CE- 504 (A) Urban & Town Planning

UNIT-I

Definition and classification of urban areas - Trend of urbanization - Planning process – Various stages of the planning process - Surveys in planning. Plans - Delineation of planning areas. utility of spaces, future growth etc. Role of “Urban Planner ”in planning and designing in relation with spatial organization, utility, demand of the area and supply

UNIT-II

Plan implementation- Urban Planning agencies and their functions - Financing- Public, private, Nongovernmental organizations- Public participation in Planning. Development control regulations. sustainability and rationality in planning, Components of sustainable urban and regional development, Emerging Concepts: Global City, inclusive city, Safe city, etc. City of the future, future of the city.

UNIT-III

Town and country planning act- Building bye-laws. Elements of City Planning, Zoning and land use, Housing. Introduction to landscaping, importance , objectives, principles, elements, Urban Planning standards Urban renewal for quality of life and livability.

UNIT-IV

Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems. Legal Issues in Planning and Professional Practice, Concepts and contents related to planning provision regarding property rights, Concept of Arbitration, State and Central government to deal with various matters concerning Town and Country Planning. mechanism for preparation of DP: Land Acquisition Rehabilitation and Resettlement Act 2013.

UNIT-V

Types of Development plans: Master Plan, City Development Plan, Structure Plan ,housing, land use, Water Supply & sanitation, etc., Planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).

Reference Books:-

1. Adib Kanafani.(1983). Transportation Demand Analysis. Mc Graw Hill Series in Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.
3. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.
5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.
6. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
7. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)
8. Relevant IRC Codes
9. Bruton M J (1981), “Introduction to transportation planning”, Hutchinson of London
10. Dickey J W(1980), “Metropolitan Transportation Planning”, Tata McGraw Hill
11. Principles of Transportation Engineering : P. Chakraborty and A. Das
12. Traffic Engineering and Transport Planning: : L.R. Kadyal

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Civil Engineering, V-Semester
Open Elective CE- 504 (B) Remote Sensing & GIS

UNIT-I

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

UNIT-II

Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity, Earth Rotation) and non-systematic [random] errors(Altitude, Attitude), Image enhancements(Gray Level Thresholding, level slicing, contrast stretching), image filtering.

UNIT-III

Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones

UNIT-IV

Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion.

UNIT-V

Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications.

Reference Books:-

- 1.Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
- 2.Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
- 3.Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015
- 4.Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
- 5.Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
- 6.Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

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Civil Engineering, V-Semester
Open Elective CE- 504 (C) Renewable Energy Sources

Unit - I

Renewable Energy Systems Energy Sources, Comparison of Conventional and nonconventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

Unit – II

Wind Energy System Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind- diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for stand alone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid Systems.

Unit - III

Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Phototonic System Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insolation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit - IV

Energy from oceans Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern nonconventional energy sources.

Unit - V

Electric Energy Conservation Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, airconditioning, power plants, process industries, illumination etc. Methods of Energy Audit. Measurements systems; efficiency measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

Reference Books:-

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York USA
5. Anna Mani, "Wind Energy Resource Survey in India-III", Allied Publishers Ltd., New Delhi,
6. S.P. Sukhatme: Solar Energy, TMH- 4e,
8. Solanki –Renewable Energy Technologies – PHI Learning
9. Sawhnew –Non Conventional Energy Resources – PHI Learning

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Civil Engineering, V-Semester
Open Elective CE- 504 (D) Innovations and Entrepreneurship

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Civil Engineering, V-Semester
CE505- Quantity Surveying & Costing (Lab)

List of Experiments:

- 1.. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project.

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Civil Engineering, V-Semester
CE506- Material Testing Lab

List of Experiments:

1. To determine the normal consistency of cement.
2. To determine the initial and final setting time of cement .
3. To determine compressive strength of cement.
4. To determine the soundness of cement.
5. To determine the fineness modulus of fine aggregate & course aggregate.
6. Mix design of concrete by IS code Method.
7. Slump test for determining workability of concrete.
8. Compressing strength of concrete cube.
9. To determine the flexure strength of concrete.

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Civil Engineering, VI-Semester
CE601- Structural Design & Drawing (RCC-I)

Unit - I

Basic Principles of Structural Design: Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

Unit - II

Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

Unit-III

Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

Unit -IV

Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

Unit -V

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slabless tread-riser staircase. NOTE :- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)
Laboratory Work: Laboratory work will be based on the above course as required for engineering projects.

Reference Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia 8. Structural Design & Drawing by N.K.Raju.

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Civil Engineering, VI-Semester
CE602- Environmental Engineering-I

Unit – I

Estimation of ground and surface water resources. quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

Unit – II

Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations.

Unit – III

Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

Unit – IV

Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

Unit – V

Characteristics and analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

Reference Books: -

1. Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi
3. Water & Waste Water Technology by Mark J.Hammer - Prentice - Hall of India, New Delhi
4. Environmental Engineering - H.S. Peavy & D.R.Rowe-Mc Graw Hill Book Company,New Delhi
5. Water Supply & Sanitary Engg. by S.K. Husain
6. Water & Waste Water Technology - G.M. Fair & J.C. Geyer
7. Relevant IS

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Civil Engineering, VI-Semester
CE 603- Design of Steel Elements

Unit 1

Introduction, properties of structural steel, I.S. rolled sections, I.S. specifications. Design approach, elastic method, limit state design.

Unit 2

Connections, simple and moment resistant riveted, bolted and welded Connections. Tension members, steel members subject to axial tension.

Unit 3

Compression members, struts and columns. Roof trusses, roof & side coverings, design loads, purlins, members, end bearings.

Unit 4

Built-up columns, beams, stability of flange and web, built-up sections. Plate-girders including stiffeners, splices and curtailment of flange plates.

Unit 5

Beam column, stability consideration, Iteration formulae, column bases, slab base, gusseted base and grillage footings.

Reference Books:

- 1) Arya, A.S. and Ajmani, J.L., "Design of Steel Structures", Nem Chand & Bros 2000.
- 2) Duggal, S.K., "Design of Steel Structures", Tata McGraw-Hill, 2006
- 3) Negi, L.S., "Design of Steel Structures", Tata McGraw-Hill, 2006

Uttarakhand Technical University, Dehradun
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Civil Engineering, VI-Semester Departmental Elective
CE 604(A) Water Resource Engineering

Unit - I

Irrigation water requirement and Soil-Water-Crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Unit - II

Ground Water and Well irrigation: Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge-necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence causes and effects. Reclamation of water logged and salt affected lands. Types of wells, well construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

Unit-III

Hydrology: Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, Scurve hydrograph, synthetic unit hydrograph.

Unit - IV

Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz. Dams, Spillways, Weirs, Barrages, Canal Regulation Structures.

Unit-V

Floods: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

Reference Books: -

1. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
2. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
3. Engg. Hydrology - J.NEMEC - Prentice Hall
4. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
5. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
6. Engg. Hydrology by H.M. Raghunath

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VI-Semester Departmental Elective
CE 604(B) Precast & Modular Construction

Unit – I

Introduction-Need for prefabrication – Principles – Materials – Modular coordination – Standardization –Systems – Production – Transportation – Erection.

Unit – II

Prefabricated components-Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

Unit – III

DESIGN PRINCIPLES Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

Unit – IV

Joints in Structural Members-Joints for different structural connections – Dimensions and detailing – Design of expansion joints

Unit – V

Design of abnormal load: Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.

Reference Books: -

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., “Knowledge based process planning for construction and manufacturing”, Academic Press Inc., 1994

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New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VI-Semester Departmental Elective
CE 604(C) Cost Effective & ECO-Friendly Structures

Unit -I

Concepts of energy efficient & environment friendly materials and techniques. Cost effective materials :- Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer. Energy Efficient & Environment friendly building material products:- Walls - Stabilised and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferrocement partitions. Roofs - Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

Unit -II

Cost effective construction techniques and equipments :- (a) Techniques :- Rat trap bond construction, Energy Efficient roofings, Ferrocement technique, Mud Technology. (b) Equipments :- Brick moulding machine, Stabilised soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

Unit -III

Cost effective sanitation:- (a) Waste water disposal system (b) Cost effective sanitation for rural and urban areas (c) Ferrocement Drains

Unit -IV

Low Cost Road Construction:- Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

UNIT-V

Cost analysis and comparison:- (a) All experimental materials (b) All experimental techniques Green Building rating systems

Reference books:-

1. Alternative Building Materials and Technologies – K S Jagadeesh, B V Venkatta Rama Reddy & K S NanjundaRao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – AskoSarja –CRC Press
3. Non-conventional Energy Resources –D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford
5. Lynne Elizabeth, Cassandra Adams Alternative Construction : Contemporary Natural BuildingMethods ”, Softcover, Wiley & Sons Australia, Limited, John,2005
6. Givoni, “Man, Climate, Architecture, Van Nostrand, New York, 1976.
7. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery,John Wiley & Sons,2005.
8. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976

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New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VI-Semester Open Elective
CE 605(A) Operation Research

Unit I

Linear Models: The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

Unit II

Transportation Models And Network Models: Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

Unit III

Inventory Models: Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

Unit IV

Queueing Models: Queueing models – Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

Unit V

Decision Models: Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique – Dynamic Programming – Simple Problem.

Reference books:-

Taha H.A., “Operations Research”, Sixth Edition, Prentice Hall of India, 2003.

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Civil Engineering, VI-Semester Open Elective
CE 605(B) Environmental Impact Assessment

UNIT-I

Concept of EIA : Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

UNIT-II

Methods of Impact Identification : Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

UNIT-III

Impact analysis : Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

UNIT-IV

Preparation of written documentation : Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

UNIT-V

Public Participation in Environmental Decision making : Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

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Civil Engineering, VI-Semester Departmental Elective
CE 605(C) Advance Pavement Design

Unit -I

Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

Unit -II

Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

Unit -III

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

Unit -IV

Rigid pavement design: IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis. PAVEMENT JOINTS: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

Unit -V

Evaluation and Strengthening of Existing Pavements: Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Reference Books:--

1. Principles of pavement design by E.J.Yoder & M.W. Witzak
2. AASHTO, "AASHTO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidelines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

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New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VI-Semester
CE606- Advance surveying lab

List of Experiments

1. Measurement of Distance by Chaining and Ranging.
2. Locating Various Objects by Chain or Cross-Staff Surveying.
3. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
5. Fixing bench mark with respect to temporary bench mark with dumpy level by fly levelling and check levelling.
6. Measurement of vertical angles with theodolite.
7. Determination of horizontal distance between two inaccessible points with theodolite.
8. Locating given building by theodolite traversing
9. To perform complete survey with Total Station.