

For Batches 2015 & Onwards
Academic Autonomous Institute (No. F22-1/2014 (AC))

Beant College of Engineering & Technology,
Gurdaspur

Scheme and Syllabus
of
B. Tech. Civil Engineering (CE)
Batch 2015 onwards

By
Board of Studies Civil Engineering

Third Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTAM-301	Engineering Mathematics-III	3	1	-	40	60	100	4
BTCE-301	Fluid Mechanics-I	3	1	-	40	60	100	4
BTCE-302	Rock Mechanics & Engineering Geology	3	0	-	40	60	100	3
BTCE-303	Strength of Materials	4	1	-	40	60	100	5
BTCE-304	Surveying	3	1	-	40	60	100	4
BTCE-305	Building Materials & Construction	3	0	-	40	60	100	3
BTCE-306	Fluid Mechanics Lab	-	-	2	30	20	50	1
BTCE-307	Strength of Materials Lab	-	-	2	30	20	50	1
BTCE-308	Surveying Lab	-	-	3	30	20	50	2
BTCE-309	Workshop Training of 4 weeks duration after 2nd semester Carpentry, Electrical, Plumbing, Masonry, CAD				30	20	50	1
Total		20	04	07	360	440	800	28

Fourth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-401	Geomatics Engineering	3	1	-	40	60	100	4
BTCE-402	Construction Machinery & Works Management	3	1	-	40	60	100	4
BTCE-403	Design of Concrete Structures-I	4	1	-	40	60	100	5
BTCE-404	Fluid Mechanics-II	3	1	-	40	60	100	4
BTCE-405	Irrigation Engineering-I	3	1	-	40	60	100	4
BTCE-406	Structural Analysis-I	4	1	-	40	60	100	5
BTCE-407	Concrete Technology Lab	-	-	2	30	20	50	1
BTCE-408	Structural Analysis Lab	-	-	2	30	20	50	1
BTCE-409	General Fitness	-	-	-	100	-	100	1
Total		20	06	04	400	400	800	29

For Batches 2015 & Onwards
Academic Autonomous Institute (No. F22-1/2014 (AC))

Beant College of Engineering & Technology, Gurdaspur

Third Semester

BCET

BTAM-301 Engineering Mathematics-III

Internal Marks: 40
External Marks: 60
Total Marks: 100

L	T	P
3	1	0

Objectives: To make students familiar with some specific mathematical concepts and tools to understand and analyze the electronics and communication based engineering problems. The exposure of these tools will enhance the analytical ability to deal with engineering problems.

1. Fourier Series

Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different wave forms (6)

2. Laplace Transforms

Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equation. (8)

3. Special Functions

Power series solution. of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation. (8)

4. Partial Differential Equations

Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients, Solution by the method of separation of variables. (8)

5. Functions of Complex Variable

Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. (6)

Books:

1. Kreyszing, E., Advanced Engineering Mathematics, Eighth edition, John Wiley, New Delhi.
2. Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3. Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.
4. Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth Publishing Company.
5. Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, I. K. Publisher.
6. Babu Ram, Advance Engineering Mathematics, Pearson Education.
7. Bindra, J. S., Applied Mathematics, Volume-III, Kataria Publications.
8. Advanced Engineering Mathematics, O'Neil, Cengage Learning.

BTCE-301 Fluid Mechanics-I

Internal Marks: 40
External Marks: 60
Total Marks: 100

L	T	P
3	1	0

1. Fluid and Properties

Concept of fluid, difference between solids, liquids and gases, ideal and real fluids, continuum concept of fluid, density, specific weight, relative density, viscosity and its dependence on temperature, surface tension and capillarity, vapor pressure and cavitation, compressibility and bulk modulus, Newtonian and non-Newtonian fluids. (5)

2. Fluid Statics

Concept of pressure, Pascal's law and hydrostatic paradox, action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure, force on a curved surface due to hydrostatic pressure. Buoyancy and flotation, stability of floating and submerged bodies, Meta centric height and its determination. (6)

3. Fluid Kinematics

Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, pathline and streakline, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates, rotational flows, rotational velocity and circulation, stream & velocity potential functions. (6)

4. Fluid Dynamics

Euler's equation, Bernoulli's equation and steady flow energy equation, representation of energy changes in fluid system, impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions. (6)

5. Dimensional Analysis and Similitude

Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies. (5)

6. Flow Past Immersed Bodies

Drag and lift, deformation drag and pressure drag, drag on a sphere, cylinder and airfoil, Magnus effect and circulation, lift on a circular cylinder. (6)

7. Flow Measurement

Manometers, Pitot tubes, venturimeter, orifice meters, orifices, mouthpieces, notches (Rectangular and V-notches) and weirs (Sharp crested Weirs). (4)

Books:

1. Fluid Mechanics & Hydraulic Machines by R.K. Bansal, Luxmi Publications.
2. Fluid mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria and Sons.
3. Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth, Rajsons Publications Pvt. Ltd.

4. Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker.
5. Fluid Mechanics by J. F. Douglas, J.M. Gasiorek, J.P. Swaffield, L.B. Jack, Pitman.
6. Fluid Mechanics: Streetes VL & Wylie EB, Mcgraw Hill book company.
7. Introduction to Fluid Mechanics by Robert W. Fox & Alan T. McDonald.
8. Fluid Mechanics by Potter, Cengage Learning.

BCET

BTCE-302 Rock Mechanics & Engineering Geology

Internal Marks: 40
External Marks: 60
Total Marks: 100

L	T	P
3	0	0

1. General Geology

Importance of engineering geology applied to civil engineering practices, weathering, definition, types and effect, geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition. (7)

2. Rocks & Minerals

Minerals, their identification, igneous, sedimentary & metamorphic rocks, classification of rocks for engineering purposes, rock quality designation (RQD). (6)

3. Structural Geology

Brief idea about stratification, apparent dip, true dip, strike and unconformities, folds. Faults & joints: definition, classification relation to engineering operations. (5)

4. Engineering Geology

Geological considerations in the engineering projects like tunnels, highways, dams, reservoirs, foundation. Earthquake: Definition, terminology, earthquake waves, intensity, recording of earthquake. (5)

5. Engineering Properties of Rocks and Laboratory Measurement

Uniaxial compression test, tensile test, permeability test, shear test, size and shape of specimen. Confining pressure, stress strain curves of typical rocks strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature. (5)

6. In-situ determination of Engineering Properties of Rocks

Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable test, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses, bore hole test. (6)

7. Improvement in Properties of Rocks

Pressure grouting for dams and tunnels, rock reinforcement rock bolting. (6)

Books:

1. Introduction to Rock Mechanics: Richard E. Goodman.
2. Engineering Behaviour of rocks: Farmar, I.W.
3. Rock Mechanics and Engineering: Jaager C.
4. Fundamentals of Rock Mechanics: Jaager and Cook.
5. Engineering Geology: D.S.Arora.
6. Engineering Geology: Parbin Singh.
7. Rock Mechanics for Engineering: B.P. Verma.

BTCE-303 Strength of Material

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
4 1 0

1. Concept of Equilibrium

Load, reaction & support, general equilibrium equations, equilibrium of a point in space, equilibrium of a member, concept of free body diagrams, displacements, concept of statical-determinacy and indeterminacy. (5)

2. Simple Stress and Strains

Introduction, concept of stress and strain, generalized Hooke's law, stress-strain diagram of ductile and brittle materials, compound and composite bars, thermal stresses. Elastic constants, relations between various elastic constants, lateral strain, volumetric strain, Poisson's ratio, stress and strains in thin cylinders, spherical shells and thin vessels subjected to internal pressures. (8)

3. Complex Stress and Strains

Introduction, Normal stress, tangential stress, Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress, Concept of principal stress and its computation, Mohr circle, Principal strains, computation of principal stresses from the principal strains. (6)

4. Shear Force and Bending Moment Diagrams

Introduction to the concept of reaction diagrams, shear force and bending moment, role of sign conventions, types of load, shear force and bending moment diagrams for simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed, varying load and moment, relationship between load, shear force and bending moment. (8)

5. Bending and Shear Stresses

Introduction, assumptions and derivation of flexural formula for straight beams, centroid of simple and built up section, second moment of area, bending stress diagrams for beams of simple and built up section, composite sections (flitched sections), and shear stress. (5)

6. Columns and Struts

Stability of columns, buckling load of an axially loaded columns with various end conditions, Euler's and Rankine's formula, columns under eccentric load. (4)

7. Torsion of Circular Shafts

Torsion, basic assumptions, derivation of torsion equation, Power transmitted by shafts, analysis and design of solid and Hollow shafts based on strength and stiffness, Sections under combined bending and torsion, equivalent bending and torsion. (6)

8. Failure Theories

Maximum principal stress theory, maximum shear stress theory, distortion energy theory, strain energy theory. (4)

Books:

1. D.S. Bedi, Strength of Materials, Khanna Book Publishing Company.
2. E.P. Popov, Mechanics of Materials-(SI Version), Prentice Hall India.
3. R.S. Lehari and A.S. Lehari, Strength of Materials, Kataria and Sons.
4. S.S. Rattan, Strength of Materials, Tata McGraw Hill.
5. Timoshenko and Young, Elements of Strength of Materials, East West Press (EWP).
6. James M Gere and Barry J. Goodno, Strength of Materials, Cengage Learning.
7. James M Gere, Mechanics of Materials, Thomson Brooks/Cole/Pearson, 2006.
8. R.C. Hibbeler, Mechanics of Materials, 6th Edition, Pearson Education, 2007.

BCET

BTCE-304 Surveying

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Introduction

Definition, principles of surveying, different types of surveys, topographical map, scale of map. (3)

2. Chain and Compass Surveying

Direct & indirect ranging measurement of distances with chain and tape, offsets, chain tape corrections, types of bearing and measurement, calculation of angles from bearings. (6)

3. Plane Table Surveying

Setting up the plane table and methods of plane tabling. (4)

4. Leveling and Contouring

Setting up a dumpy level, methods of levelling, finding levels by rise & fall method and height of instrument method, corrections due to curvature and refraction. Characteristics of contours, methods of contouring, uses of contour maps. (4)

5. Theodolite Traversing

Temporary and permanent adjustments, measurement of horizontal and vertical angles, adjustment of closing error by Bowditch & Transit rules. (4)

6. Tachometry

Definition, determination of tachometer constants and reduced level from tachometric observations. (6)

7. Triangulation

Selection of stations and base line, corrections for base line, satellite station, use of total station for surveying. (6)

8. Curves

Different types of curves and their use. Elements of a simple, circular curve. Different methods of setting out of these curves. (6)

Books:

1. Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill (2006).
2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, Laxmi Publications (2005).
3. Agor, R., Surveying, Khanna Publishers (1982).
4. Bhavikatti, S.S. Surveying & Levelling Volume I&II (2009).

BTCE-305 Building Materials & Construction

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 0 0

1. Building Stones & Bricks

Characteristics of a good building stone, Deterioration and preservation of stones, Artificial gtones, Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks. (3)

2. Cement

Types, uses and composition of cement, raw materials, manufacturing process, varieties and properties of cement, hydration of cement, testing of cement. (3)

3. Concrete

Introduction, constituents of concrete, batching of materials, manufacturing process of cement concrete, workability and factors affecting it, use of different waste materials in concrete, methods to determine workability, segregation and bleeding of concrete, strength of concrete and factors affecting it. (5)

4. Timber

Structure of a tree, classification of trees, qualities of good timber, defects in timber, seasoning of timber, decay of timber, preservation of timber. (3)

5. Miscellaneous Materials

Use of Aluminium, Glass, Plastics etc.in construction. (2)

6. Foundation and Walls

Definition, types of foundation, causes of failures of foundation and remedial measures, types of wall and thickness considerations. (3)

7. Brick and Stone Masonry

Types of bond & their merits and demerits. Rubble and ashlar joints in stone masonry. Cement concrete hollow blocks and their advantages and disadvantage. (3)

8. Damp Proofing

Causes of dampness, preventive measures for dampness in buildings. (2)

9. Roofs

Classification of roofs and roof trusses, members of roof trusses different roof covering materials. (2)

10. Plastering and Pointing

Advantages of plastering and painting, methods of plastering, materials and types, defects in plastering, different types of finishing plastered surface. (3)

11. Floors

Types of floors used in building & and their suitability, factors for selecting suitable floor for building. (3)

12. Miscellaneous Topics

Building services – Plumbing, Electrical, Air conditioning, Accoustics & sound insulation, Fire protection measures, Lift. (4)

Books:

1. Rangwala – Building materials.
2. Bindra SP, Arora KR Building construction.
3. Shetty MS, Concrete Technology.
4. Punmia BC, Building construction.
5. Singh, Parbin, Building materials.
6. Sushil Kumar, Building Construction.

BCET

BTCE-306 Fluid Mechanics Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L	T	P
0	0	2

1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.
2. To study the flow through a variable area duct and verify Bernoulli's energy equation.
3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter/orifice meter).
4. To determine the discharge coefficient for a Vee notch or rectangular notch.
5. To determine the coefficient of discharge for Broad crested weir.
6. To determine the hydraulic coefficients for flow through an orifice.
7. To determine the friction coefficient for pipes of different diameter.
8. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.
9. To determine the velocity distribution for pipe line flow with a pitot static probe.

BTCE-307 Strength of Materials Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L	T	P
0	0	2

1. To draw Stress Strain curve for Ductile and Brittle material in tension.
2. To draw Stress Strain curve for Ductile and Brittle material in compression.
3. To draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing
4. To draw load deflection curve for spring in loading and unloading conditions.
5. To determine the hardness of the given material by Rockwell and Brinell hardness testing machine.
6. To determine the fatigue strength of the material.
7. To determine the impact strength by Izod and Charpy test.
8. To determine the flexural strength of timber/steel beam.

BCET

BTCE-308 Surveying Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L	T	P
0	0	3

1. Measurement of distance, ranging a line.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
3. Determination of level by height of instrument, rise & fall methods.
4. Measurement of horizontal and vertical angle by theodolite.
5. Determination of tachometric constants and determination of reduced levels by tachometric observations.
6. Plane table survey, different methods of plotting - two point & three-point problem.
7. Determination of height of an inaccessible object.
8. Setting out a transition curve. Setting out of circular curves in the field using different methods.

BTCE-309 Workshop Training

Internal Marks: 30
External Marks: 20
Total Marks: 50

L T P
- - -

This will be held after 2nd Semester during summer in the Institute Workshop for four weeks daily for 4 hrs. The students will be trained in the area of Carpentry, Electrical, Plumbing, Masonary and CAD work.

BCET

For Batches 2015 & Onwards
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Beant College of Engineering & Technology, Gurdaspur

Fourth Semester

BCET

BTCE-401 Geomatics Engineering

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Photogrammetry

Introduction, basic principles, photo-theodolite, elevation of a point by photographic measurement, aerial camera, vertical photograph, tilted photograph, scale, crab and drift, flight planning for aerial photography, ground control for photogrammetry, photomaps and mosaics, stereoscopic vision, stereoscopic parallax, stereoscopic plotting instruments, introduction of electronic total station & their applications. (9)

2. Remote Sensing

Introduction, basic principles, electromagnetic (EM) energy spectrum, EM radiations and the atmosphere, interaction of EM radiations with earth's surface, types of remote sensing systems, remote sensing observation platforms, satellites and their characteristics – geo-stationary and sun-synchronous, earth resources satellites, meteorological satellites, sensors, types and their characteristics, across track and along track scanning, applications of remote sensing. (9)

3. Geographical Information System (GIS)

Definition, GIS objectives, hardware and software requirements for GIS, components of GIS, coordinate system and projections in GIS, data structure and formats, spatial data models – raster and vector, data inputting in GIS, data base design - editing and topology creation in GIS, linkage between spatial and non spatial data, spatial data analysis – significance and type, attribute query, spatial query, vector based spatial data analysis, raster based spatial data analysis, errors in GIS, integration of RS and GIS data, digital elevation model, network analysis in GIS, GIS software packages. (9)

4. Global Positioning System (GPS)

Introduction, fundamental concepts, GPS system elements and signals, GPS measurements and accuracy of GPS, satellite movement, GPS satellites, co-ordinate systems - geoids, ellipsoid and datum, spheroid, customized local reference ellipsoids, national reference systems, worldwide reference ellipsoid, WGS 84, differential-GPS, classification of GPS receivers, GPS applications. (9)

Books:

1. Arora, K.R., 2007: Surveying Vol-III, Standard Book House.
2. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications.
3. Chang.T.K. 2002: Geographic Information Systems, Tata McGraw Hill.
4. Heywood. I, Cornelius S, Crver Steve. 2003: An Introduction to Geographical Information Systems, Pearson Education.
5. Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press.
6. Punmia, B.C., Jain A.K., 2005: Higher Surveying, Luxmi Publications
7. Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H. Freeman and company.
8. Kaplan, E.D., Understanding GPS: Principles and Application, Artec House, 2 Edition

BTCE-402 Construction Machinery and Works Management

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Introduction

Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs. (4)

2. PERT

Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems, probability of achieving scheduled project. (10)

3. CPM

Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems. (6)

4. Cost Analysis and Contract

Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems, updating a project, when to update, time grid diagram, resource scheduling, planning of different components of civil engineering projects such as a house, workshop, dam, tunnel. (8)

5. Construction Equipment and Machinery

Dragline, Hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment, maintenance and repair cost, Hoisting & Transporting Equipments- Hoists, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons, Construction Equipments, concrete pumps, Working flow diagram of RMC Plant, Bituminous Plant, Paver Plant. (6)

6. Software

Introduction of relevant software. (2)

Books:

1. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi
2. PERT and CPM - L.S.Srinath, East West Press
3. Management Guide to PERT & CPM - Wiest & levy; Prentice Hall
4. Construction Equipment & Planning and Application. - Mahesh Verma Artec Publication.
5. Construction Planning and Management by U. K. Shrivastava; Galgotia Publications Pvt. Ltd.

BTCE-403 Design of Concrete Structures-I

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
4 1 0

Note: Relevant Indian Code of Practices is permitted in Examination.

Part A: CONCRETE TECHNOLOGY

1. Concretes & Admixtures

Various ingredients of concrete and their properties. Various types of admixtures and their uses. (5)

2. Properties of Concrete

Different properties of fresh and hardened concrete and their testing procedure. (5)

3. Mix Design

Concrete mix design as per IS method. Factors affecting strength and durability of concrete and acceptance criteria. (7)

Part B: DESIGN OF REINFORCED CONCRETE ELEMENTS

- I. Concept and Methods of Structural Design, Objectives, Properties of Concrete and Steel, Stress-Strain behavior of Steel and Concrete. (5)
- II. Design Philosophies: Working Stress Method, Limit State Method. (5)
- III. Analysis & Design of Simply Supported Beams – (Rectangular and Flanged Sections). (7)
- IV. Analysis & Design for Shear, Bond, Anchorage, Development Length and Torsion. (7)
- V. Analysis & Design of One and Two way Slabs, Stairs. (7)

Books:

1. Properties of Concrete by A.M.Neville – Prentice Hall
2. Concrete Technology by M.S.Shetty. – S.Chand & Co.;
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
4. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
5. Advanced Design of Structures N. Krishna Raju
6. Advanced RCC Design Pillai & Mennon ; Tata MacGraw Hill
7. Limit State Design Ramachandra
8. Limit State Design A.K. Jain
9. Limit State Design of Reinforced Concrete P.C. Vergese

BTCE-404 Fluid Mechanics-II

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Laminar Flow

Navier-stokes equations in Cartesian coordinates (no derivation), meaning of terms, Flow through circular section pipe, flow between parallel plates, stokes law. Flow through porous media, Transition from laminar to turbulent, Critical velocity and critical Reynolds Number. (7)

2. Turbulent Flow

Turbulent flows and flow losses in pipes, Darcy equation, minor head losses in pipe fittings, hydraulic and energy gradient lines. Definition of turbulence, scale and intensity, effects of turbulent flow in pipes. Equation for velocity distribution in smooth and rough pipes (no derivation). Resistance diagram. (7)

3. Boundary Layer Analysis

Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. (4)

4. Uniform Flow in Open Channels

Flow classifications, basic resistance Equation for open channel flow. Chezy, Manning, Bazin and Kutter formulae. Variation of roughness coefficient, conveyance and normal depth. Velocity Distribution. Most efficient rectangular, trapezoidal and circular flow sections. (5)

5. Energy and Momentum Principles and Critical Flow

Energy and specific energy in an open channel; critical depth for rectangular and trapezoidal channels. alternate depths. Applications of specific energy to transitions and broad crested weirs. Momentum and specific force in open channel flow, sequent depths. (4)

6. Gradually varied Flow

Different Equation of water surface profile; limitation, properties and classification of water and surface profiles with examples, computation of water surface profile by graphical, numerical and analytical approaches. (7)

7. Hydraulic Jump and Surges

Theory of jump, elements of jump in a rectangular channel, length and height of jump, location of jump, energy dissipation and other uses, positive and negative surges. (5)

Books:

1. Hydraulics & Fluid Mechanics by P.N. Modi and S.M. Seth; Standard Publication
2. Flow in Open Channels by K. Subraminayam; Tata MacGraw Hill
3. Introduction to Fluid Mechanics by Robert N. Fox & Alan T. Macnold
4. Fluid Mechanics : R.K. Bansal; Laxmi Publications
5. Fluid Mechanics : Jagdish Lal; Metropolitan Book Co. (P) Ltd.

BTCE-405 Irrigation Engineering-I

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Introduction

Importance of Irrigation engineering, purposes of irrigation, objectives of irrigation, benefits of irrigation, advantages of various techniques of irrigation-- Furrow Irrigation, Boarder strip Irrigation, basin irrigation, sprinkler irrigation, drip irrigation. (5)

2. Methods of Irrigation

Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta, Duty of water, Base Period, relation between delta, duty and base period, Soil crop relation-ship and soil fertility. (4)

3. Canal Irrigation

Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories. (5)

4. Lined Canals

Types of lining, selection of type of lining, economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining. (4)

5. Losses in Canals, Water Logging and Drainage

Losses in canals- evaporation and seepage, water logging, causes and ill effects of water logging anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, advantages and maintenance of tile drains. (4)

6. Investigation and Preparation of Irrigation Projects

Classification of project, project preparation-investigations, design of works and drawings, concept of multi - purpose projects, major, medium and miner projects, planning of an irrigation project, economics & financing of irrigation works. Documentation of project report. (6)

7. Tube - Well Irrigation

Types of tube wells - strainer type, cavity type and slotted type. Type of strainers, aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, assumptions, Theim's & Dupuit's formulae, limitations of Theim's and Dupuit's formulae. Interference of tube wells with canal or adjoining tube-wells, causes of failure of tube wells, optimum capacity, duty and delta of a tube well. Rehabilitation of tube well. (6)

8. River Training Works

Objectives, classification of river-training works, Design of guide banks. Groynes or spurs - their design and classification ISI. Recommendations of approach embankments and afflux embankments, pitched islands, natural cut-offs and artificial cut-offs and design considerations. (6)

Books:

1. Principles & practice of Irrigation Engineering S.K.Sharma, S. Chand, Limited.
2. Irrigation & Water Power Engineering B.C. Punmia, Pande B.B.Lal, Laxmi Publications (P) Ltd
3. Fundamentals of Irrigation Engineering Dr. Bharat Singh, Nem Chand & Bros
4. Irrigation Engineering & Hydraulic Structure S.R.Sahasrabudhe, S. K. Kataria & Sons
5. Irrigation Engineering & Hydraulic Structure Varshney, Gupta & Gupta, Nem Chand and Brothers
6. Irrigation Engineering & Hydraulic Structure Santosh Kumar Garg, Khanna Publishers

BCET

BTCE-406 Structural Analysis- I

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
4 1 0

1. Displacements

Concept; Governing differential equation for deflection of straight beams; Following methods for determination of structural displacements:

- I. Geometric Methods: Double integration; Macaulay's method; Moment area method; Conjugate beam method.
- II. Energy Methods: Strain energy in members, , Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, unit load method, deflections of trusses and 2D-frames. (12)

2. Determinate Structures

Concept of determinacy; analysis of determinate structural elements—truss, arch, beam, frame, cables; internal forces in determinate structures; determinate reaction diagram-- bending moment, shear force, radial shear, normal thrust diagrams for the determinate structures.

- I. Analysis of plane trusses, compound and complex trusses using method of joints, method of sections, tension coefficients.
- II. Analysis of three-hinged arch of various shapes under different loading conditions.
- III. Analysis of simple portal frame, cables under different loading conditions. (12)

3. Moving Loads and Influence Line Diagrams

Concept of influence line diagram, rolling loads; bending moment and shear force diagrams due to single and multiple concentrated rolling loads, uniformly distributed moving loads; equivalent UDL; Muller Breslau principle; influence lines for different structural parameters in beams; calculation of the maximum and absolute maximum shear force and bending moment; concept of envelopes; influence line for displacements; influence line for bar force in trusses. (10)

4. Analysis of Cables and Suspension Bridges

General cable theorem, analysis of cables supported at same or different levels, shape, elastic stretch of cable, maximum tension in cable and back-stays, pressure on supporting towers, suspension bridges, three hinged stiffening girders. (8)

5. Analysis of Dams, Chimneys and Retaining Walls

Introduction, loadings for the dams, chimneys, and retaining walls; limit of eccentricity for no-tension criteria; concept of core; middle-third rule; maximum/minimum base pressures.. (6)

Books:

- 1 Basic structural Analysis C.S.Reddy; Tata McGraw-Hill Education
- 2 Analysis of Structures Vol- I and Vol.-II Vazirani & Ratwani; Khanna Publishers
- 3 Intermediate structural Analysis C.K.Wang; McGraw-Hill
- 4 Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
- 5 Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

BTCE-407 Concrete Technology Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L	T	P
0	0	2

1. To determine the specific gravity and soundness of cement.
2. To determine the standard consistency, initial and final setting times of cement and compressive strength of cement.
3. To determine the fineness modulus, bulk density, water absorption and specific gravity of fine and coarse aggregates.
4. To determine the slump, compaction factor and Vee-Bee time of concrete.
5. Mix design of concrete by IS methods.
6. To determine the compressive strength of concrete using cube and cylinder.
7. To carry out the split tensile and flexural strength of concrete.
8. Compressive strength of brick and tile as per IS standard

Books/Manuals

1. Concrete Manual by Dr. M.L. Gambhir, Dhanpat Rai & Sons Delhi.
2. Concrete Lab Manual by TTTI Chandigarh
3. Concrete Technology, Theory and Practice by M.S.Shetty. S.Chand & Company.

BTCE-408 Structural Analysis Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L T P
0 0 2

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the flexural rigidity of a given beam.
3. To verify the Moment- area theorem for slope and deflection of a given beam.
4. Deflection of a fixed beam and influence line for reactions.
5. Deflection studies for a continuous beam and influence line for reactions.
6. Study of behavior of columns and struts with different end conditions.
7. Experiment on three-hinged arch.
8. Experiment on two-hinged arch.
9. Deflection of a statically determinate pin jointed truss.
10. Forces in members of redundant frames.
11. Experiment on curved beams.
12. Unsymmetrical bending of a cantilever beam.

Books/Manuals

A Laboratory Manual on Structural Mechanics by Dr. Harvinder Singh, New Academic Publishing Comp. Ltd.

For Batches 2016 & Onwards
Academic Autonomous Institute (No. F22-1/2014 (AC))

Beant College of Engineering & Technology,
Gurdaspur

Scheme and Syllabus

of

B. Tech. Civil Engineering (CE)

Batch 2016 onwards

By

Board of Studies Civil Engineering

Third Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTAM-301	Engineering Mathematics-III	3	1	-	40	60	100	4
BTCE-301	Fluid Mechanics-I	3	1	-	40	60	100	4
BTCE-302	Rock Mechanics & Engineering Geology	3	0	-	40	60	100	3
BTCE-303	Strength of Materials	4	1	-	40	60	100	5
BTCE-304	Surveying	3	1	-	40	60	100	4
BTCE-305	Building Materials & Construction	3	0	-	40	60	100	3
BTCE-306	Fluid Mechanics Lab	-	-	2	30	20	50	1
BTCE-307	Strength of Materials Lab	-	-	2	30	20	50	1
BTCE-308	Surveying Lab	-	-	3	30	20	50	2
BTCE-309	Workshop Training of 4 weeks duration after 2nd semester Carpentry, Electrical, Plumbing, Masonry, CAD				30	20	50	1
Total		20	04	07	360	440	800	28

Fourth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-401	Geomatics Engineering	3	1	-	40	60	100	4
BTCE-402	Construction Machinery & WorksManagement	3	1	-	40	60	100	4
BTCE-403	Design of ConcreteStructures-I	4	1	-	40	60	100	5
BTCE-404	Fluid Mechanics-II	3	1	-	40	60	100	4
BTCE-405	Irrigation Engineering-I	3	1	-	40	60	100	4
BTCE-406	Structural Analysis-I	4	1	-	40	60	100	5
BTCE-407	Concrete Technology Lab	-	-	2	30	20	50	1
BTCE-408	Structural Analysis Lab	-	-	2	30	20	50	1
BTCE-409	General Fitness	-	-	-	100	-	100	1
Total		20	06	04	400	400	800	29

Fifth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-501	Design of Steel Structures-I	4	1	-	40	60	100	5
BTCE-502	Geotechnical Engineering	4	1	-	40	60	100	5
BTCE-503	Structural Analysis-II	3	2	-	40	60	100	5
BTCE-504	Transportation Engineering-I	3	1	-	40	60	100	4
BTCE-505	Environmental Engineering –I	3	1	-	40	60	100	4
BTCE-	Open Elective-1	3	0	0	40	60	100	3
BTCE-506	Transportation Engineering Lab	-	-	2	30	20	50	1
BTCE-507	Geotechnical Engineering Lab	-	-	2	30	20	50	1
BTCE-508	Computer Aided Structural Drawing -I	-	-	2	30	20	50	1
BTCE-509	Survey Camp of 04 weeks duration after 4th Semester	20	6	6	100	50	150	2
Total					430	470	900	31

Sixth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-601	Design of Concrete Structures-II	4	1	-	40	60	100	5
BTCE-602	Foundation Engineering	4	1	-	40	60	100	5
BTCE-603	Professional Practice	3	2	-	40	60	100	5
BTCE-604	Environment Engineering –II	3	1	-	40	60	100	4
BTCE-	Open Elective -II	3	0	-	40	60	100	3
BTCE-	Departmental Elective -I	3	1	-	40	60	100	3
BTCE-605	Environmental Engineering Lab	-	-	2	30	20	50	1
BTCE-606	Computer Aided Structural Drawing II	-	-	2	30	20	50	1
BTCE-607	General Fitness	-	-	-	100	-	100	1
Total		20	6	4	400	400	800	28

Departmental Elective-I

BTME-901 Numerical Methods in Civil Engineering
BTME-902 Finite Element Methods

Open Elective-I

BTME-951 Hydrology and Dams
BTME-952 Traffic Engineering

Open Elective-II

BTME-961 Building Maintenance and Safety
BTME-962 Project Monitoring and Management

BCET

For Batches 2016 & Onwards
Academic Autonomous Institute (No. F22-1/2014 (AC))

Beant College of Engineering & Technology, Gurdaspur

Fifth Semester

BCET

BTCE 501 Design of Steel Structures – I

Internal Marks: 40	L	T	P
External Marks: 60	4	1	0
Total Marks: 100			

Note: Relevant Indian Codes of Practice are permitted in Examination.

1. Introduction

Properties of structural steel, I.S. rolled sections, I.S. specifications. (4)

2. Connections

Riveted, bolted and welded connections for axial and eccentric loads. (5)

3. Tension members

Design of members subjected to axial tension. (5)

4. Compression members

Design of axially loaded members, built-up columns, laced and battened columns including the design of lacing and battens. (5)

5. Flexural members

Design of laterally restrained and un-restrained rolled and built-up sections, encased beams. (5)

6. Column bases

Design of slab base, gusseted base and grillage foundation. (6)

7. Roof truss

Design loads, combination of loads, design of members (including purlins) and joints, detailed working drawings. (6)

Books & Codes:

- 1) Limit state design of steel structures: S K Duggal, Mc Graw Hill
- 2) Design of steel structures: N Subramanian Oxford Higher Education
- 3) Design of steel structures (Vol. 1): Ram Chandra Standard Book House - Rajsons
- 4) Design of steel structures (by limit state method as per IS: 800-2007): S S Bhavikatti / K International Publishing House
- 5) IS 800: 2007 (General construction in steel-Code of practice)*
- 6) SP: 6(1) (Handbook for structural engineers-Structural steel sections)*

* permitted in Examination

BTCE-502 Geotechnical Engineering

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
41 0

1. Basic Concepts

Definition of soil and soil mechanics, common soil mechanics problems in Civil Engineering. Principal types of soils. Important properties of very fine soil. Characteristics of main Clay mineral groups. Weight volume relationship and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods. (4)

2. Index Properties

Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse and fine grained soils as per Indian Standard. (6)

3. Compaction

Definition and object of compaction and concept of O.M.C. and zero Air Void Line. Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties and their discussion. Field compaction methods- their comparison of performance and relative suitability. Field compactive effort, Field control of compaction by proctor. (6)

4. Consolidation

Definition and object of consolidation, Difference between compaction and consolidation. Concept of various consolidation characteristics i.e. a_v , m_v and c_v , primary and secondary consolidation. Terzaghi's Differential equation and its derivation. Boundary conditions for Terzaghi's solution for one dimensional consolidation concept of c_v , t_v & U . Consolidation test determination of c_v from curve fitting methods, consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect of disturbance on e - $\log \sigma$ curves of normally consolidated clays, importance of consolidation settlement in the design of structures. (8)

5. Permeability and Seepage

Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quick sand condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, co-efficient of permeability (k) and its determination in the laboratory. Average permeability of stratified soil mass, factors affecting 'k' and brief discussion. (6)

6. Shear Strength

Stress analysis of a two dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength coulomb - Mohr strength theory. Relation between principal stresses at failure. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions typical strength envelopes for clay obtained from these tests. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands. (6)

7. Stability of Slopes

Slope failure, base failure and toe failure - Swedish circle method - $\phi=0$ analysis and $c=0$ analysis - friction circle method - Taylor's stability number - stability charts - sliding block analysis. **(5)**

Books:

1. Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
2. Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers & Distributors*.
4. Principle of Geotechnical Engineering by B.M.Das Cengage Publisher
5. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao New Age International Publishers
6. Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
7. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

BCET

BTCE-503 Structural Analysis-II

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 2 0

1. Indeterminate Structures

Concept of indeterminate /redundant structures; Static and kinematic indeterminacies; stability of structures; internal forces; Conditions of stress-strain relationships, equilibrium and compatibility of displacements. **(6)**

2. Indeterminate Structural Systems

Pin-jointed and rigid-jointed structural systems; Deformation of redundant structures-sway and non-sway frames, elastic curve; Static equilibrium and deformation compatibility checks; Effects of support settlement and lack of fit; Fixed-end moments—member loading, sinking of supports, temperature; Analysis of redundant beams, frames, trusses, arches using following methods:

a) Conventional Methods

Slope deflection method; Moment distribution method; Rotation contribution method (Kani's Method).

b) Classical Methods

Methods of consistent deformation; Theorem of three moments.

c) Approximate Methods

Portal method; Cantilever method; Substitute frame method. **(14)**

3. Influence Line Diagrams

Concept and application in the analysis of statically indeterminate structures; Influence line for bar forces in the statically indeterminate trusses, beams and frames. **(10)**

Books:

1. Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2. Intermediate structural analysis - C . K. Wang. McGraw Hill
3. Indeterminate structural analysis - J. Sterling Kinney Addison-Wesley Educational Publishers
4. Theory of structures - B.C. Punima, Laxmi Publications
5. Structural Analysis, Devdas Menon, Narosa Publishers.

BTCE-504 Transportation Engineering – I

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Introduction

Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.(3)

2. Highway Development & Planning

Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys.(3)

3. Highway Alignment

Requirements, Alignment of Hill Roads, Engineering Surveys.(3)

4. Highway Geometric Design

Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.(3)

5. Highway Materials

Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.(4)

6. Highway Construction

Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.(3)

7. Highway Drainage and Maintenance

Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.(4)

8. Design of flexible Pavements

Methods for design of pavements (3)

9. Traffic Characteristics

Road User Characteristics, Driver Characteristics, Vehicular Characteristics.(3)

10. Traffic Studies

Volume Studies, Speed Studies, O-D Survey, Parking Study.(3)

11. Traffic Safety and Control Measures

Traffic Signs, Markings, Islands, Signals, Cause and Type of Accidents, Use of Intelligent Transport System.(3)

12. Traffic Environment Interaction

Noise Pollution, Vehicular Emission, Pollution Mitigation Measures.(3)

Books:

1. Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand & Company Ltd., New Delhi, 1985.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, New Delhi.

BCET

BTCE-505 Environmental Engineering – I

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Introduction

Beneficial uses of water, water demand, per capita demand, variations in demand, water demand for fire fighting, population forecasting and water demand estimation. (5)

2. Water sources and development

Surface and ground water sources; Selection and development of sources; Assessment of potential; Flow measurement in closed pipes, intakes and transmission systems. (6)

3. Pumps and pumping stations

Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations. (5)

4. Quality and Examination of Water

Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria. (6)

5. Water treatment

Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and defluoridation, and water desalination and demineralization, taste and odour removal. (7)

6. Transportation of Water

Pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems. (6)

7. Rural water supply

Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques. (6)

Books:

1. Water Supply Engineering- Environmental Engg. (Vol.-I) by B.C. Punmia, Ashok Jain, Arun Jain, Laxmi Publications, New Delhi.
2. Environmental Engg. - A design Approach by Arcadio P. Sincero and Gregoria P. Sincero, Prentice Hall of India, New Delhi.
3. "Environmental Engg." By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition
4. Water Supply Engineering- Environmental Engg. (Vol. – I) by S.K. Garg, Khanna Publishers, Delhi.
5. Water Supply and Sewerage by Steel EW and McGhee, Terence J.; McGraw Hill.

BTCE-506 Transportation Engineering Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L T P
002

I Tests on Sub-grade Soil

1. California Bearing Ratio Test

II Tests on Road Aggregates

2. Crushing Value Test
3. Los Angeles Abrasion Value Test
4. Impact Value Test
5. Shape Test (Flakiness and Elongation Index)

III Tests on Bituminous Materials and Mixes

6. Penetration Test
7. Ductility Test
8. Softening Point Test
9. Flash & Fire Point Test
10. Bitumen Extraction Test

IV Field Tests

11. Roughness Measurements Test by Roughometer
12. Benkelman Beam Pavement Deflection Test

Books/Manuals:

1. Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", Nem Chand and Brothers, Roorkee.

BTCE-507 Geotechnical Engineering Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

L T P
002

1. Determination of in-situ density by core cutter method and Sand replacement method.
2. Determination of Liquid Limit & Plastic Limit.
3. Determination of specific gravity of soil solids by pycnometer method.
4. Grain size analysis of sand and determination of uniformity coefficient (C_u) and coefficient of curvature (C_c).
5. Compaction test of soil.
6. Determination of Relative Density of soil.
7. Determination of permeability by Constant Head Method.
8. Determination of permeability by Variable Head method.
9. Unconfined Compression Test for fine-grained soil.
10. Direct Shear Test
11. Tri-axial Test
12. Swell Pressure Test

Books:

1. Soil Testing Engineering, Manual By Shamsheer Prakash and P.K. Jain. Nem Chand & Brothers

BTCE-508 Computer Aided Structural Drawing

Internal Marks: 30

External Marks: 20

Total Marks: 50

L T P
002

1. Structural Drawings of Reinforced Concrete Elements such as Beams, Slabs.
2. Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams, Column Base, and Roof Trusses.

BCET

BTCE-509 Survey Camp

Internal Marks: 100

External Marks: 50

Total Marks: 150

Survey Camp of four weeks duration will be held immediately after IVth semester examination at a Hilly Terrain. The students are required to prepare the Topographical Map of the area by traditional method. Students should also be exposed to modern Survey Equipment and practices, like Total Station, Automatic Level, GPS etc.

BCET

BTCE - 951 Hydrology and Dams

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
30 0

1. Introduction

Precipitation: Importance of hydrological data in water resources planning. The hydrologic cycle. Mechanics of precipitation, types and causes, measurement by rain gauges, Gauge net-works, hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves, depth area-duration curves.

- a) Interception, Evapo-transpiration and Infiltration: Factors affecting interception, evaporation from free water surfaces and from land surfaces, transpiration, Evapo-transpiration.
b) Infiltration Factors affecting infiltration, rate, Infiltration capacity and its determination. **(10)**

2. Runoff:

Factors affecting runoff, run-off hydrograph, unit hydrograph theory, S-curve hydrograph, Snyder's synthetic unit hydrograph. **(4)**

3. Peak Flows

Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumbel's method, design flood and its hydrograph. **(4)**

4. Gravity Dams-Spillways:

Creagers profiles neglecting velocity of approach, profile taking velocity of approach into account, Upstream lip and approach ramp, Advantages of gated spillways, Discharge characteristics of spillways. **(4)**

5. Arch and Buttress Dams:

Classification of arch dam- constant radius, constant angle and variable radius , Cylinder theory, Expression relating central angle and Cross-Sectional area of arch. Types of buttress dams, Advantages of buttress dams. **(4)**

6. Earth Dams:

Components of earth dams and their functions, Phreatic line determination by analytical and graphical methods. **(4)**

Books:

1. Engineering Hydrology - J.Nemec, Prentice Hall
2. Engineering Hydrology by Stanley Buttlar, John. Wiley
3. Ground Water Hydrology by TODD, John. Wiley
4. Engineering for Dams Vol. II & III by Creager Justin & Hinds. John. Wiley
5. Hydrology by. S.K.Garg, Khanna Pub
6. Hydrology Principles, Analysis and Design by. Raghunath, H M, New Age Int. Pub

BTCE-952 Traffic Engineering

Internal Marks: 40	L	T	P
External Marks: 60		30	0
Total Marks: 100			

1. Introduction

Elements of Traffic Engineering, Components of traffic system – road users, vehicles, highways and control devices. (3)

2. Vehicle Characteristics

IRC standards, Design speed, volume, Highway capacity and levels of service, capacity of urban and rural roads, PCU concept and its limitations. (3)

3. Traffic Stream Characteristics

Traffic stream parameters, characteristics of interrupted and uninterrupted flows. (3)

4. Traffic Studies

Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, parking studies, accident studies. (4)

5. Traffic Regulation and Control

Signs and markings, Traffic System Management, At-grade intersections, Channelization, Roundabouts. (3)

6. Traffic Signals

Pre-timed and traffic actuated. Design of signal setting, phase diagrams, timing diagram, Signal co-ordination. (4)

7. Grade Separated Intersections

Geometric elements for divided and access controlled highways and expressways. (3)

8. Traffic Safety

Principles and practices, Road safety audit. (4)

9. Intelligent Transportation System

Applications in Traffic Engineering. (3)

Books:

1. William, R.M. and Roger, P.R., "Traffic Engineering", Prentice Hall.
2. Hobbs, F.D., "Traffic Planning and Engineering", Pergamon Press.
3. Khisty, C.J. and Kent, B.L., "Transportation Engineering – An Introduction", Prentice Hall of India Pvt. Ltd.
4. Kadiyali, L.R., "Traffic Engineering & Transport Planning", Khanna Publishers, New Delhi.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, New Delhi.

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Sixth Semester

BCET

BTCE-601 Design of Concrete Structures-II

Internal Marks: 40	L	T	P
External Marks: 60	4	1	0
Total Marks: 100			

Note: Relevant Indian Codes of Practice and Design handbooks are permitted (as per note mentioned below) in Examination.

1. Stairs

Types and Design of Stairs. (5)

2. Foundations

Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing (Rectangular, Trapezoidal, Strap), Raft Footing. (6)

3. Compression Members

Definitions, Classifications, Guidelines and Assumptions, Design of Short Axially Loaded Compression Members, Design of Short Compression Members under Axial Load with Uniaxial and biaxial Bending, Preparation of Design Charts, Design of Slender Columns. (9)

4. Design of Continuous beams and curved beam.

(5)

5. Design of Domes.

(4)

6. Design of Retaining walls

Cantilever type retaining wall, Counterfort type retaining wall. (5)

7. Introduction to water retaining structures

Design of circular and rectangular water tanks resting on ground. (6)

Books:

1. Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
2. Limit state Design of Reinforced Concrete; Varghese P C; Prentice-Hall of India Pvt. Ltd”.
3. Reinforced Cement Concrete, Mallick and Rangasamy; Oxford-IBH.

BIS Codes of practice and Design Handbooks:

1. *IS 456-2000*- Indian Standard. Plain and Reinforced concrete -Code of practice
2. *IS 3370- Code of practice for concrete structures for storage of liquids
3. *Design Aid SP 16
4. Explanatory hand book SP24.
5. Detailing of Reinforcement SP 34

Note: The codes marked with * are permitted in examination.

BTCE-602 Foundation Engineering

Internal Marks: 40
External Marks: 60
Total Marks: 100

L	T	P
4	1	0

1. Soil Investigation

Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples- Open Drive samples, Stationery piston sampler, Rotary sampler, Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T. (7)

2. Earth Pressure

Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, K_a and K_p for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfill. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load). (8)

3. Shallow Foundation

Type of shallow foundations, Depth and factors affecting it. Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine's analysis and Terzaghi's analysis. Types of failures. Factors affecting bearing capacity. Skempton's equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test. Boussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmark's chart and its construction. 2:1 method of load distribution. Comparison of Boussinesq and Westergaard analysis for a point load. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts, Proportioning of Rafts, Methods of designing raft, Floating foundation. (8)

4. Pile Foundations

Necessity and uses of piles, Classification of piles, Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of Engineering News Formula and Hiley's Formula for determination of allowable load. Limitations of pile driving formulae. Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Labare formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Related

Numerical problems. Settlement of pile groups in sand, Negative skin friction. Related numerical Problem. (8)

5. Caissons and Wells

Major areas of use of caissons, advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Forces acting on a well foundation. Computation of scour depth. (7)

Books -

1. Soil Mech. & Foundation Engg, by K.R.Arora, Standard Publishers Distributors
2. Geotechnical Engineering, by P. Purshotama Raj
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy
4. Principle of Foundation Engineering by B.M.Das, CL Engineering
5. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, New Age International
6. Soil Mech. & Foundations by Muni Budhu Wiley, John Wiley & Sons
7. Geotechnical Engineering by Gulhati and Datta, Tata McGraw - Hill Education
8. Foundation Engineering by Varghese P.C, PHI Learning.
9. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publication.
10. Foundation Analysis and Design by Bowles J.E, Tata McGraw - Hill Education

BTCE-603 Professional Practice

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 2 0

1. Estimates

Method of building estimates, types, site plan index plan, layout plan, plinth area, floor area, Technical sanction, administrative approval, estimate of buildings, roads, earthwork, R.C.C. works, sloped roof, roof truss, masonry platform, complete set of estimate. (5)

2. Schedule of Rates, analysis of rates

For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork. (6)

3. Specifications

For different classes of building and Civil engineering works. (5)

4. Rules and measurements for different types of Civil engineering works. (4)

5. Types of contracts

Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order. (5)

6. Accounts

Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure. (4)

7. Arbitration

Acts and legal decision-making process. (4)

Books:

1. Estimating and Costing by B.N. Datta, UBSPD, New Delhi
2. Estimating and Costing by G.S. Birdie, Dhanpat Rai Publication New Delhi .
3. Estimating and Costing by V.N. Chakravorty, Calcutta
4. Civil Engg. Contracts & Estimates by B.S. Patil, Orient-Longman Ltd., New Delhi.

BTCE-604 Environmental Engineering – II

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

1. Introduction

Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions. (3)

2. Sewerage System

Generation and estimation of community Sewage, flow variations, stormwater flow, types of sewers. Design of sewers and storm water sewers, construction & maintenance of sewers, sewer appurtenances, sewage pumping and pumping stations. (5)

3. House Drainage

Principles of house drainage, traps, sanitary fittings, system of plumbing, drainage lay out for residences. (5)

4. Characteristics of Sewage

Composition of domestic and industrial sewage, sampling, physical, chemical and microbiological analysis of sewage, biological decomposition of sewage, BOD and BOD kinetics, effluent disposal limits. (4)

5. Treatment of Sewage

Introduction to unit operations and processes - Primary treatment; screening (theory), grit chamber (theory and design), floatation units, sedimentation tanks (theory and design), Secondary treatment units; ASP (theory and design), Sequencing batch reactors (theory and design), Trickling filters (theory and design) Anaerobic systems; Anaerobic filters (theory), UASB (theory), Anaerobic lagoons, Sludge Handling and disposal; thickening, stabilization, dewatering, drying and disposal. (5)

6. Low Cost Sanitation Systems

Imhoff tanks (theory and design), septic tank (theory and design), soakage pit/soil absorption systems; stabilization ponds (theory and design); macrophyte ponds; oxidation ponds (theory and design) and constructed wetland systems. (4)

7. Wastewater Treatment Plants and Advanced Wastewater Treatment

Treatment Plants; site selection, plant design, Hydraulic Profiles, operation and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection and polishing. (4)

Books:

1. Waste Water Engg. (Environmental Engg.-II) by B.C.Punmia, Ashok Jain, Laxmi Publications, New Delhi.
2. Environmental Engg. - A design Approach by Arcadio P. Sincero and Gregoria P. Sincero, Prentice Hall of India, New Delhi.

3. “Waste Water Engineering - Treatment and Reuse” by Metcalf & Eddy, TMH, New Delhi.
4. “Environmental Engg.” By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition
5. Environmental Engineering (Vol. II) by S.K. Garg, Khanna Publishers, Delhi.

BCET

BTCE -605 Environmental Engineering Laboratory

Internal Marks: 40
External Marks: 60
Total Marks: 100

L	T	P
0	0	2

1. To measure the pH value of a water/waste water sample
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water/water sample
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To determine the concentration of sulphates in water/wastewater sample.
10. To find chlorides in a given sample of water/waste water.
11. To find acidity/alkalinity of a given water sample
12. To determine the COD of a wastewater sample.

Books:

1. Chemistry for Enviromental Engg. and Science by Sawyer & McCarty, TMH, New Delhi
2. Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

BTCE-606 Computer Aided Structural Drawing – II

Internal Marks: 40
External Marks: 60
Total Marks: 100

L	T	P
0	0	2

1. Structural Drawings of Reinforced Concrete Elements as per BTCE-601

BCET

BTME-901 Finite Element Methods

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
310

1. Introduction

The finite element method - the element characteristic matrix - element assembly and solution for unknowns - summary of finite element history - basic equations of elasticity – strain displacement relations - theory of stress and deformation - stress-strain-temperature relations. (3)

2. The direct stiffness method

Structure stiffness equations - properties of $[K]$ - solution of unknowns - element stiffness equations - assembly of elements - node numbering to exploit matrix sparsity - displacement boundary conditions - gauss elimination solution of equations conservation of computer storage - computational efficiency - stress computation - support reactions - summary of the finite element procedure. (4)

3. Stationary principles, Rayleigh-Ritz and interpolation

Principle of stationary potential energy - problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method - piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for C0 and C1 elements – lagrangian interpolation functions for two and three dimensional elements. (5)

4. Displacement based elements for structural mechanics

Formulae for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test stress calculation – other formulation methods. (3)

5. Straight sided triangles and tetrahedral

Natural coordinates for lines - triangles and tetrahedral - interpolation fields for plane triangles - linear and quadratic triangle - quadratic tetrahedron. (3)

6. The isoparametric formulation

Introduction - an isoparametric bar element - plane bilinear element - summary of gauss quadrature - quadratic plane elements - direct construction of shape functions for transition elements - hexahedral (solid) isoparametric elements – triangular isoparametric elements - consistent element nodal loads - validity of isoparametric elements - appropriate order of quadrature - element and mesh instabilities - remarks on stress computation. (4)

7. Coordinate transformation

Transformation of vectors - transformation of stress, strain and material properties - transformation of stiffness matrices - transformation of flexibility to stiffness – inclined support - joining dissimilar elements to one another- rigid links - rigid elements. (3)

8. Bending flat plates

Plate bending theory - finite elements for plates - triangular discrete Kirchhoff element - boundary

conditions.

(3)

9. Introduction to weighted residual method

Some weighted residual methods - galerkinfinite element method - integration by parts - axially loaded bar - beam - plane elasticity.

(3)

Books:

1. Desai C.S., *Elementary Finite Element Method*, Prentice Hall of India
2. Chandrupatla T.R. & Belegundu A.D., *Introduction to Finite Elements in Engineering*, Prentice Hall of India
3. Bathe K.J., *Finite Element Procedures in Engineering Analysis*, Prentice Hall of India
4. Gallagher R.H., *Finite Element Analysis: Fundamentals*, Prentice Hall Inc.
5. Rajasekaran S., *Finite Element Analysis in Engineering Design*, Wheeler Pub.
6. Krishnamoorthy C. S., *Finite Element Analysis - Theory and Programming*, Tata McGraw Hill
7. Zienkiewics O.C. & Taylor R.L., *The Finite Element Method*, Vol I & II, McGraw Hill

BCET

BTCE-902 Numerical Methods in Civil Engineering

Internal Marks: 40	L	T	P
External Marks: 60	3	1	0
Total Marks: 100			

1. Equation

Roots of algebraic transcendental equation, Solution of linear simultaneous equations by different methods using Elimination, Iteration, Inversion, Gauss-Jordan and method. Homogeneous and Eigen Value problem, Non-linear equations, Interpolation. (6)

2. Finite Difference Technique

Initial and Boundary value problems of ordinary and partial differential equations, Solution of Various types of plates and other civil engineering related problems. (6)

3. New Marks Methods

Solution of determinate and indeterminate structures using Newmark's Procedure (Beam). (4)

4. Statistical Methods

Method of correlation and Regression analysis for fitting a polynomial equation by least square. (6)

5. Initial Value problem

Galerkin's method of least square, Initial Value problem by collocation points, Rungekutta Method. (4)

6. New Marks Method

Implicit and explicit solution, solution for nonlinear problems and convergence criteria. (4)

Books:

1. Numerical Mathematical Analysis: James B. Scarborough Oxford and IBH Publishing, 1955.
2. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI Learning (2012).
3. Introduction To Computer Programming and Numerical Methods by Xundong Jia and Shu Liu, Dubuque Iowa: Kendall/Hunt Publishing Co.
4. Numerical Methods, J.B Dixit , USP (Laxmi publication),

BTCE-961 Building Maintenance & Safety

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 0 0

1. Principles of Maintenance

Importance of maintenance, deterioration and durability, factors affecting decision to carry out maintenance, maintenance and GNP, agencies causing deterioration, effect of deterioration agencies on materials. (4)

2. Maintenance Management

Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance. (5)

3. Materials for Maintenance

Compatibility of repair materials, durability and maintenance, types of materials, their specification and application, criteria for selection of material, use of commercial available materials in maintenance. (4)

4. Maintenance Problems and Root Causes

Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes. (4)

5. Investigation and Diagnosis for Repair of Structures

Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis and repair steps. (6)

6. Remedial Measures for Building Defects

Preventive maintenance and special precautions - considerations, preventive maintenance for floors, joints, wet areas, water supply and sanitary systems, termite control, common repair techniques, common methods of crack repair - Repair of existing damp proofing systems in roofs, floors and wet areas - Protection, repair and maintenance of RCC elements - Repair, maintenance of foundations, basements and DPC - Repair of finishes - Repair of building joints - Repair of water supply and sanitary systems, underground and over head tank - Common strengthening techniques - Maintenance of Industrial Floors. (7)

7. Maintenance of Multi-Storey Buildings

Special features for maintenance of multi-storied buildings, including fire protection system, elevators booster pumps, generator sets. (4)

Books:

1. Building Repair and Maintenance Management, by P. S. Gahlot
2. Maintenance of Buildings by A C Panchdhari
3. Maintenance and Repairs of Buildings by Pijush Kanti Guha

BCET

BTCE-962 Project Monitoring & Management

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 0 0

1. Introduction

Need for project planning & management, time, activity & event, barchart, Milestone chart, uses & drawbacks. (7)

2. PERT

Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems. (8)

3. CPM

Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance, numerical problems. (8)

4. Cost Analysis and Contract

Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems, updating a project, when to update, time grid diagram, resource scheduling, planning of different components of engineering projects. Introduction of relevant open source software(s) (9)

Books:

1. PERT and CPM - L.S.Srinath, East West Press
2. Management Guide to PERT & CPM - Wiest & levy; Prentice Hall
3. Construction Equipment & Planning and Application. - Mahesh Verma , Artec Publication.
4. Construction Planning and Management by U. K. Shrivastava; Galgotia Publications Pvt. Ltd.