

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**

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

### 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
<b>Total</b>		<b>20</b>	<b>04</b>	<b>07</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>28</b>

### 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
<b>Total</b>		<b>20</b>	<b>06</b>	<b>04</b>	<b>400</b>	<b>400</b>	<b>800</b>	<b>29</b>

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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>1</b>	<b>0</b>

**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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>1</b>	<b>0</b>

**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.

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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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>0</b>	<b>0</b>

**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, 6<sup>th</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>2</b>

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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>2</b>

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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>3</b>

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.

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**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**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>2</b>

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.