## Study scheme

| S. No. | Category | Subject Code | Course Title | Hours per week | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| 1 | Professional Core courses | BTCE-301-18 | Surveying & Geomatics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 2 | Professional Core courses# | BTCE-302-18 | Solid Mechanics# | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 3 | Professional Core courses # | BTCE-303-18 | Fluid Mechanics# | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 4 | Basic Science Course | BTAM-301-18 | MathematicsIII (Transform & Discrete | 4 | 1 | 0 | 40 | 60 | 100 | 4 |
| 5 | Engineering Science Course | BTEC-305-18 | Basic Electronics & applications in Civil Engineering | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 6 | Humanities and Social Sciences including Management | HSMC-132-18 | Civil Engineering-Introduction, Societal & Global Impact | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 7 | Professional Core courses | BTCE-306-18 | Surveying & Geomatics Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 8 | Professional Core courses | BTCE-307-18 | Fluid Mechanics Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 9 | Professional Core courses | BTCE-308-18 | Solid Mechanics Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 10 | | BMPD-301-18 | Mentoring and Professional Development | 0 | 0 | 2 | Satisfactory/ Unsatisfactory | | | - |
| 11 | Pofessional Skill Enhancement | BTCE-332-18 | Training – I* | - | - | - | 60 | 40 | 100 | 1 |
| | | | 29 | 19 | 2 | 8 | 390 | 460 | 850 | 24 |

**\* Students have already completed 3 weeks institutional training and field and market survey in Summer vacation which is to be evaluated by viva-voce condcuted along End semester exam of Third semester.**

**Note : # These are the minimum contact hrs. allocated.**

**The contact hrs. may be increased by institute as per the need based on the content of subject.**

| S No | Category | Subject Code | Course Title | Hours Per Week | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| 1 | Professional Core courses | BTCE-401 | Concrete Technology | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 2 | Professional Core courses | BTCE-402 | Material, Testing & Evaluation | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| 3 | Professional Core courses | BTCE-403 | Hydrology & Water Resources | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 4 | Professional Core courses | BTCE-404 | Transportation Engineering | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 5 | Professional Core courses | BTCE-405 | Disaster Preparedness & | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 6 | Basic Sciences (Mandatory Courses) | EVS-101-18 | Environment Science (Non- credit) | 2 | 0 | 0 | 50 | - | 50 | 0 |
| 7 | Professional Core courses | BTCE-406-18 | Concrete Testing Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 8 | Professional Core courses | BTCE-407-18 | Transportation Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 9 | Professional Skill Enhancement | | Training –II* | 0 | 0 | 0 | - | - | - | - |
| 10 | | BMPD-401-18 | Mentoring and Professional Development | 0 | 0 | 2 | Satisfactory/ Unsatisfactory | | | - |
| | | | **26** | **18** | **2** | **6** | **310** | **340** | **650** | **20** |

**Fourth Semester**

* 2 weeks survey camp and 4 weeks industrial/institutional training for which viva will be condcuted along End semester examination of Fifth semester.

| S No | Category | Subject Code | Course Title | Hours Per Week | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| | | | | | | | | | | |

**Fifth Semester**

| S No | Category | Subject Code | Course Title | L | T | P | Int | Ext | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Professional Core courses | BTCE-501-18 | Engineering Geology | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 2 | Professional Core courses | BTCE-502-18 | Elements of Earthquate | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 3 | Professional Core courses | BTCE-503-18 | Construction Engineering & Management | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 4 | Professional Core courses | BTCE-504-18 | Environmental Engineering | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| 5 | Professional Core courses | BTCE-505-18 | Structural Engineering | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 6 | Professional Core courses # | BTCE-506-18 | Geotechnical Engineering# | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 7 | Professional Core courses | BTCE-507-18 | Geotechnical Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 8 | Professional Core courses | BTCE-508-18 | Environmental Engineering Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 9 | Professional Core courses | BTCE-509-18 | Structural Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 10 | | BMPD-501-18 | Mentoring and Professional | 0 | 0 | 2 | Satisfactory/ Unsatisfactory | | | - |
| 11 | Professional Skill Enhancement | BTCE-532-18 | Training – II* | - | - | - | 60 | 40 | 100 | 1 |
| | | | **28** | **19** | **1** | **8** | **390** | **460** | **850** | **24** |

* Students have already completed 2 weeks survey camp and 4 weeks summer internship in Summer vacation which is to be evaluated by viva-voce condcuted along End semester exam of Fifth semester.

**Sixth Semester**

| S No | Category | Subject Code | Course Title | L | T | P | Int | Ext | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Professional Core courses | BTCE- | Estimation & Costing and Professional | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 2 | Professional Core courses | BTCE-116 | Construction Practices | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 3 | Professional Elective courses | BTCE-XXX | Elective – I | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 4 | Professional Elective courses | PECE-XXX | Elective – II | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 5 | Professional Core courses | BTCE-109 | CAD Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 6 | Open Elective courses | OEZZ-XXX | Open Elective – I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 7 | Project | PRCE-102 | Minor Project (Estimation & costing ) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| 8 | Mandatory Courses | MCXX-XX | Constitution of India | 2 | 0 | 0 | 50 | - | 50 | 0 |
| 9 | | BMPD-601-18 | Mentoring and Professional | 0 | 0 | 2 | Satisfactory/ Unsatisfactory | | | - |
| | | | **28** | **17** | **3** | **8** | **340** | **360** | **700** | **21** |

# 6 weeks industrial/institutional training for which viva will be condcuted along End semester exam of Seventh semester.

**Seventh Semester**

| S No | Category | Subject Code | Course Title | Hours Per Week | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| 1 | Professional Elective courses | PECE-XXX | Elective – III | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 2 | Professional Elective courses | PECE-XXX | Elective – IV | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 3 | Open Elective courses | OEZZ-XXX | Open Elective – II(Metro sytem and Engg) | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 4 | Professional Core courses | BTCE- | Sofwate Application Lab | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| 5 | Project | PRCE- | Project -I (Project work / internship in industry or at appropriate work place) | 0 | 0 | 6 | 120 | 80 | 200 | 3 |
| 6 | Project/Training | BTCE-732-18 | Training - III | - | - | - | 60 | 40 | 100 | 2 |
| 7 | Mandatory Courses (Non-credit) | BTMC-XXXX | Management- I (Organizational Behavior and Entrepreneurship) | 2 | 0 | 0 | 50 | - | 50 | 0 |
| 8 | | BMPD-701-18 | Mentoring and Professional | 0 | 0 | 2 | Satisfactory/ Unsatisfactory | | | - |
| | | | | 23 | 11 | 2 | 10 | 430 | 320 | 750 | 17 |

**Eighth Semester**

| S No | Category | Subject Code | Course Title | Hours Per Week | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Int | Ext | Total | |
| 1 | Professional Elective courses | PECE-XXX | Elective – V | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 2 | Professional Elective courses | PECE-XXX | Elective – VI | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| 3 | Open Elective courses | OEZZ-XXX | Open Elective – III | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 4 | Project | PRCE-104 | Project -II (Project work / internship in industry or at appropriate work place) | 0 | 0 | 6 | 120 | 80 | 200 | 3 |
| 5 | | BMPD-801-18 | Mentoring and Professional | 0 | 0 | 2 | Satisfactory/ Unsatisfactory | | | - |
| | | | | 19 | 9 | 2 | 8 | 240 | 260 | 500 | 14 |

# 3<sup>rd</sup>  Sem  Syllabus

| | | | **Third Semester** | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Category** | **Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | |
| 1 | Professional Core courses | BTCE-301-18 | **Surveying & Geomatics** | 3 | 1 | 0 | 4 |

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

**Course Outcome**
The course will enable the students to:
1. Understand the concept, various methods and techniques of surveying
2. Compute angles, distances and levels for given area
3. Apply the concept of tachometry survey in difficult and hilly terrain.
4. Select appropriate instruments for data collection and survey purpose
5. Analyze and retrieve the information from remotely sensed data and interpret the data for survey.
6. Understand the concepts related to GIS and GPS and analyze the geographical data.

## Content

**Unit-I:** *Introduction to Surveying***:** Principles, Survey stations, Survey lines- ranging, direct &indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction Levelling:, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling(Radiation and three point problem only).

**Unit-II:** *Triangulation and Trilateration***:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline - choices  - extension of base lines - corrections - Trigonometric leveling .

**Unit-III:** *Curves:* Elements of simple and compound curves – Method of setting out Transition curve – length of curve – Elements of transition curve.

*Photogrammetry  Surveying*: Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping-mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

**Unit-IV:** *Modern Field Survey Systems*: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based)

*Remote Sensing*: Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

**Refernces & Books**
1. Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I,  II & III, Laxmi Publications
3. Agor, R., Surveying, Khanna Publishers
4. Bhavikatti, S.S. Surveying & Levelling Volume I & II

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|----|----|----|---------|
| | | | | L | T | P | |
| 2 | Professional Core courses# | BTCE-302-18 | **Solid Mechanics** | 3 | 0 | 0 | 3 |

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

**Course Outcomes**
1. Understand the concept of static equilibrium, deformations, and material constitutive behaviour.
2. Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyze structural members subjected to tension, compression and torsion.
3. Apply the concept of Mohr's circle in the stress/strain calculations.
4. Develop SFD and BMD for different type of beams subjected to different types of loads
5. Plot elastic curves for beams undergoing displacements under different loadings
6. Understand the behaviour of columns and struts under axial loading.

# Content

**Unit-I:** *Concept of Equilibrium:* Loads, supports, reactions, displacements; General equilibrium equations; Equilibrium of a point and a member; Concept of free body diagram; Statical determinacy of a problem.

*Stresses and Strains:* Concept of stress and strain; Type of stresses and strains; Stress-strain diagrams for ductile, brittle materials; Generalized Hooke's law; Concept of working stress and factor of safety; Lateral strain, Poisson's ratio and Volumetric strain; Elastic moduli and relationship between them; Bars of varying section, composite bars, thermal stresses.

**Unit-II:** *Principal Stressres and Strains:* Concept of principal stresses, principal strains and principal planes; use of Mohr circle in computation of stresses and strains; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress alsowith shear stress.

*Shear Force and Bending Moment Diagrams:* Introduction to the concept of shear force, bending moment and the sign convention; Shear force and bending moment diagrams for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads, uniformly varying loads, moments or their combination, point of contra flexure.

**Unit-III: Slope and deflection**- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams..

*Bending and Shear Stresses:* Assumptions - theory of simple bending; Derivation of bending equation; Centroid and section modulus of various cross sectional shapes including rectangular, circular, I, channel, angle etc.; Determination of bending stresses, bending stress distribution across various beam sections; Determination of shear stress, shear stress distribution across various beam sections.

**Unit-IV:** *Columns and Struts:* Stability of Columns; buckling load of axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.

*Torsion of Circular Shafts:* Derivation of torsion equation and its assumptions, application of equation to circular shafts; combined torsion and bending of circular shafts, principal stress and maximum shear stress under combined loading of torsion and bending.

*Stresses and strains in thin cylinders* :spherical shells subjected to internal pressures; Normal stress, tangential stress.

**Text/Reference Books**
1. 'Elements of Strength of Materials', Timoshenko, S. and Young, D. H., DVNC, New York, USA.
2. 'Solid Mechanics', Kazmi, S. M. A., TMH, New Delhi.
3. 'Mechanics of Materials', Hibbeler, R. C., Pearson Prentice Hall.
4. 'An Introduction to the Mechanics of Solids', Crandall, S. H., N. C. Dahl, and T. J. Lardner, McGraw Hill.
5. 'Mechanics of Materials', Ferdinand P. Beer, E. Russel Jhonston Jr. and John T. D. Ewolf, TMH.
6. 'Strength of Materials', James M. Gere and Barry J. Goodno, Cengage Learning India Pvt. Ltd., New Delhi.
7. 'Strength of Materials', R. Subramanian, Oxford University Press, New Delhi.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 3 | Professional Core courses # | BTCE-303-18 | **Fluid Mechanics** | 3 | 0 | 0 | 3 |

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

## Course Outcomes

After completion of the course, student is able to
1. Understand the basic terms used in fluid mechanics and its broad principles
2. Estimate the forces induced on a plane/ submerged bodies
3. Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.
4. Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.
5. Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.
6. Design and addressing problems in open channel ( lined/ unlined) of different shapes and size optimally as per site condition.

## Content

**Unit-I:** *Basic Concepts and Definitions* – Distinction between a fluid and a solid;  Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature,  Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

*Fluid Statics* - Fluid Pressure: Pressure at a point, Pascals law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.  Buoyancy and stability of floating bodies.

**Unit-II:** *Fluid Kinematics* -  Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow;  rotational and  irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function.  One-, two- and three -dimensional continuity equations in Cartesian coordinates

*Fluid Dynamics* **-** Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude -  Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's $\pi$-Theorem.

**Unit-III:** *Laminar Flow & Turbulent Flow* - Laminar flow through: circular pipes, parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel

*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.

**Unit-IV:** *Open Channel Flow* - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform  Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel.  Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.

## References:
1. Fluid Mechanics & Hydraulic Machines : Dr. R.K. Bansal
2. Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth
3. Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker
4. Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman
5. Fluid Mechanics: Streetes VL & Wylie EB;
6. Fluid Mechanics by Potter, Cengage Learning

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 4 | Basic Science Course | BTAM-301-18 | **Mathematics-III (Transform & Discrete Mathematics)** | 4 | 1 | 0 | 4 |

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

**Course Outcomes:**

**1.** Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.

**2.** Find length, area and volume using integral calculus that is an important application in engineering.

3. Solve some real problems in engineering using Gauss Divergence and Stokes' theorem

**4.** To formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.

5. To formulate Fourier Series, its properties and its applications to solve problems in engineering.

 **Detailed Content**

**Section A**                                                                                                    **(20 lectures)**

**Unit I:** *Vector Calculus-I:* Scalar and Vector point function, Gradient, Directional derivatives, Divergence, Curl and their identities, line, surface, volume integrals and their applications, Solenoidal and Irrotational fields.

**Unit II:** *Vector Calculus-II***:** Applications of Green, Gauss and Stokes Theorems, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

**Section B**                                                                                                    **(20 lectures)**

**Unit III:** *Transforms Calculus-I:*Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.

**Unit IV** :*Transforms Calculus-II***:** Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications

**Textbooks/References:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

3. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
4. Thomas and Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 2017.
5. R. K. Jain and S.R.K Iyengar Advanced Engineering Mathematics, 5th Edition, 2017.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|---|---|---|---------|
| | | | | L | T | P | |
| 5 | Engineering Science Course | BTEC- 305-18 | **Basic Electronics & applications in Civil Engineering** | 3 | 0 | 0 | 3 |

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

**Course Objectives:**
The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the Devices, Instruments and Sensors used in Civil Engineering applications in subsequent courses.

**Course Outcomes:**
After undergoing this course students will be able to

1. Understand construction of diodes and their rectifier applications.
2. Appreciate the construction and working bipolar junction transistors and MOSFETs.
3. Design Op-Amp IC based fundamental applications.
4. Comprehend working of basic elements of digital electronics and circuits.

**Unit I**: **Semiconductor Diodes and Applications** - Semiconductor Diode - Ideal versus Practical, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications;

**Unit II**: **Transistors & Amplifiers** - Bipolar Junction Transistor (BJT) – Construction, Operation, Common Base, Common Emitter and Common Collector Configurations, Distortion, Operating Point, Voltage Divider Bias Configuration; Introduction to nMOS and pMOS.

**Unit III: Operational Amplifiers and Applications -** Introduction to Op-Amp, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground, Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator, Square Wave and Triangular Wave Generation.

**Unit IV: Digital Electronics** -Boolean Algebra - Binary, Octal, Hexadecimal Number Systems, Addition, Subtraction using 1's and 2's compliment method, Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); K-Map simplification Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop.

**Text/Reference Books:**

1.David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India.

2.SantiramKal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India.

3.Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education.

4.Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH

5.R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|----|----|----|---------|
| | | | | L | T | P | |
| 6 | Humanities and Social Sciences including Management | HSMC-132-18 | **Civil Engineering- Introduction, Societal & Global Impact** | 3 | 0 | 0 | 3 |

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

## Course Outcomes

1. Introduction to what constitutes Civil Engineering
2. Understanding the vast interfaces this field has with the society at large
3. Providing inspiration for doing creative and innovative work for the benefit of the society
4. Need to think innovatively to ensure Sustainability
5. Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field

## Content

**Unit I:** *Civil Engineering and its historical developments;* Understanding the importance of Civil Engineering in shaping and impacting the world; the ancient and modern Marvels and Wonders in the field of Civil Engineering; Scope of work involved in various branches of Civil Engineering and future vision; Recent Civil Engineering breakthroughs and innovations; Avenues for entrepreneurial working.

**Unit II:** *Understanding the past to look into the future*; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution and how these eras helped the civil engineering to grow; Concept of sustainability and the steady erosion of the environment due to haphazard developments; Global warming, its impact and possible causes; Atmospheric pollution; Pollution Mitigation measures; Health & Safety aspects for stakeholders; Environmental Impact Analysis: Concept and procedures; Innovations and methodologies for ensuring Sustainability.

**Unit III:** *Infrastructure development and growth of the Nation*; its effects on the GDP, employment, living standards of the people, etc.; Introduction and overview to Futuristic systems: Megacities, Smart Cities, Stadia; Roads, Railways, Metros, Hyper Loop, Airports, Seaports, River ways, Sea canals, Tunnels, bridges.

**Unit IV:** *Energy Generation*: Hydro, Solar, Wind, Wave, Tidal, Geothermal, Thermal energy; Telecommunication needs: towers, above-ground and underground cabling; Flood control: Dams, Canals, River interlinking; Energy efficient built-environments and LEED ratings; Awareness of various Codes & Standards governing Infrastructure development.

Suggested Readings
1 Salvadori, M and Heller, M, Strctures in Architectures, PHI.
2. Fintel, C, Handbook of Civil Engineering, CBS Publications.
3. *Ž iga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
4.Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
5.NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|------|------|------|---------|
| | | | | L | T | P | |
| 7 | Professional Core courses | BTCE-306-18 | **Surveying & Geomatics Lab** | 0 | 0 | 2 | 1 |

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

**Course Outcomes**
 After completing the course the students must demonstrate the knowledge and ability to:

1. Assess horizontal & vertical angles by Theodolite.
2. Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.
3. Compute the reduce levels using various methods of leveling.
4. Predict the location of any point horizontally and vertically using Tachometry.
5. Setting out curves in the field.
6. Use electronic survey instruments.

**Course Content**
1. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
2. Different methods of levelling, height of instrument, rise & fall methods.
3. Measurement of horizontal and vertical angle by theodolite.
4. Determination of tachometric constants and determination of reduced levels by tachometric observations.
5. Plane table survey, different methods of plotting, Three point problem.
6. Determination of height of an inaccessible object.
7. Setting out of circular curves in the field using different methods.
8. Plotting of traverse using the Total Station and GPS.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|----|----|----|---------|
| | | | | **L** | **T** | **P** | |
| 8 | Professional Core courses | BTCE-307-18 | **Fluid Mechanics Lab** | 0 | 0 | 2 | 1 |

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

**Course Outcome**
1 Select appropriate pressure measuring device under different condition of flow.
2 Determine the stability of a floating body.
3 Understand and apply Bernoulli's theorem practically.
4 Find discharge of fluid through pipe, orifices and in open channel.
5 Estimate the major and minor losses in pipe.
6 Estimate the various elements and energy losses in hydraulic jump.

**Lab Experiments**

1. To study of pressure measuring devices as peizometer, U-tube manometer, and pressure gauges.
2. To verify Bernoulli's Theorem
3. To determine the meta centric height of a of Floating Body under different condition.
4. To determine the coefficient of discharge of a Venturimeter.
5. To determine the coefficient of discharge of a Orifice Meter
6. To determine the coefficient of friction of different diameter pipes.
7. To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
8. To determine the coefficient of discharge on rectangular and V-notches.
9. To determine the various element of a hydraulic jump.

**Text/Reference Books**
1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|------|------|------|---------|
| | | | | L | T | P | |
| 9 | Professional Core courses | BTCE-308-18 | **Solid Mechanics Lab** | 0 | 0 | 2 | 1 |

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

**Course Outcomes**
1. Understand the importance of physical properties of steel.
2. Identify and comprehend code provisions for testing different properties of steel.
3. Develop stress-strain curve for axial compression, axial tension and shear.
4. Assess hardness and impact strength of steel.
5. Assess flexural strength of a given material.
6. Evaluate fatigue and impact strength of steel.

**Content**
1. Determination of physical properties of steel including strength and ductility.
2. Study of tensile and compressive stress-strain behaviour of steel.
3. Compression test on brick.
4. Development of shear stress-strain curve for steel in torsion.
5. Determination of hardness of a material by Rockwell and Brinell hardness testing machine.
6. Determination of impact strength of a material by Izod and Charpy tests.
7. Determination of bending strength of a wooden beam specimen.
8. Determination of fatigue strength of a material.
9. Study of behaviour of columns and struts with different end conditions.
10. To veify the moment area theorm for slope and deflection of a given beam.

**Text/Reference Books**
1. Laboratory Manual of Testing Materials, William Kendrick Hall

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|---|---|---|---------|
| | | | | L | T | P | |
| 10 | Professional core | BMPD-301-18 | **Mentoring and professional development** | - | - | 2 | 0 |

**Guidelines regarding Mentoring and Professional Development**

The objective of mentoring will be development of:

• Overall Personality

• Aptitude (Technical and General)

• General Awareness (Current Affairs and GK)

• Communication Skills

• Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

**Part – A (Class Activities)**

1. Expert and video lectures

2. Aptitude Test

3. Group Discussion

4. Quiz (General/Technical)

5. Presentations by the students

6. Team building Exercises

**Part – B (Outdoor Activities)**

1. Sports/NSS/NCC

2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B.

Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|---|---|---|---------|
| | | | | L | T | P | |
| 10 | Skill Enhancement | BTCE-332-18 | **Training -I** | - | - | 4 | 1 |

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

**Course Outcomes:**
After completing this course the student must demonstrate the ability to:
1. Visulize things/ concepts and express the thoughts in the form of sketchs, models, etc
2. Create a well organized document using computers
3. Work in teams
4. Acknowledge the work of other in a consistent manner
5. Understanding of ethical and professional issues
6. Demonstrate effective oral communication and presentation skills

**Content**
Module I – Instititionl Training (3 weeks)

1. Hands-on-training on MS Office/ Office suite (Word processor, Spreadsheet, Math tools, presentation/ ppt, etc.)
2. Introduction to Civil Engineering softwares and basic overview of drafting tools such as AutoCad, etc.

Module II – Field and Market Study

1. Student shall visit construction site of significantly scale and make an inventory construction and finishing materials being used.
2. Student shall do Market Survey for availability and rates of materials in the already prepared inventory.

**Note:**

1. The students need to submit a summary report of the institunal training in Module I, and A detailed report/ scrapbook ofnventory and market survey done in Module II.
2. The viva exam for the subject will be conducted alongwith the practical exams of the End-Semster Examination of Third Semester.

# 4<sup>th</sup> Sem  Syllabus

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1 | Professional Core courses | BTCE-401-18 | **Concrete Technology** | 3 | 0 | 0 | 3 |

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

**Course Outcomes**
1. Understand the relevance of different properties of constituent materials on properties of concrete.
2. Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.
3. Understand the issues involved in production and use of concrete.
4. Design of concrete mixes as per BIS specifications.
5. Understand various testing methods for concrete and their applicability.
6. Knowledge of special type of non-conventional concretes.

**Content:**

**Unit I:** *Concrete and its ingredients:* Properties of cement, aggregate, admixture, water and other additives; Related Indian Standard codes & guidelines.

*Concrete behaviour in fresh and hardened states:* Workability, Elasticity, Shrinkage, Creep, Fatigue, Strength in compression, tension, shear and bond; Influence of various factors on test results; Concrete cracking and type of cracks; Permeability and durability characteristics of concrete including resistance to sulphate & acid attack, alkali-aggregate reaction, freezing and thawing; Fire resistance.

**Unit II:** *Production of concrete:* Mixing, handling, placing, compaction of concrete and related issues; Quality control; Behaviour in extreme environmental conditions like hot weather, cold weather and under water conditions.

*Concrete mix design:* Basic considerations, proportioning of material, effect of various parameters, trial mixes, Design by IS code.

**Unit III:** *Inspection and testing of concrete:* Defects in concrete; Deterioration of concrete; Strength tests including compressive, split tensile, flexural, pullout etc.; Durability tests including permeability, carbonation, rapid chlorine ion penetration etc.; Destructive and Non-destructive testing of concrete; Acceptance and compliance requirements of concrete as per IS codes.

**Unit IV:** *Special concretes:* Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self Compacting Concrete, Pervious Concrete, Self Healing Concrete.

**Text/Reference Books**
1. 'Properties of Concrete', A. M. Neville, Prentice Hall
2. 'Concrete Technology', M. S. Shetty, S.Chand & Co.
3. 'Concrete Technology', M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4. 'Concrete Technology', A. R. Santha Kumar, Oxford University Press, New Delhi

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|------|------|------|---------|
| | | | | L | T | P | |
| 2 | Professional Core courses | BTCE-402-18 | **Materials, Testing & Evaluation** | 4 | 0 | 0 | 4 |

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

**Course Outcomes**
1. Appraisal about the role of materials in civil engineering
2. Introduce common measurement instruments, equipments and devices to capture the material response under loading
3. Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice
4. Ability to write a technical laboratory report.

**Unit-I**: Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes,;Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractories ;Bricks; Concrete hollow blocks & Interlocking tiles.

Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,

**Unit-II**: Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behaviour (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep – fundaments and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.

**Unit-III**: Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.

**Unit-IV**: Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regards for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.

**Text/Reference Books:**

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth- Heinemann

2.Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition

3.Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications

4.Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella

5.E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition

6.American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards

(post 2000)

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 3 | Professional Core courses | BTCE-403-18 | **Hydrology & Water Resources Engineering** | 3 | 1 | 0 | 4 |

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

**Outcomes**

At the end of the course, students must be in a position to:

1 Understand the interaction among various processes in the hydrologic cycle.

2 Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc

3 Understand the various component of hydro graphs and able to estimate the run off.

4 Find the water requirement for different crops and able to proposed appropriate method of applying water.

5 Understand the distribution system of canal and various components of irrigation system.

6 Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.

**Content**

**Unit I:** *Introduction -* Hydrologic Cycle, History of Hydrology, Water-Budget Equation, , World Water Balance, Applications in Engineering, Sources of Data.

*Precipitation -* Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.

**Unit II:** *Abstractions from precipitation* - Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modelling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices.

*Runoff -* Runoff Volume, SCS-CN Method of estimating runoff volume, Flow Duration Curve, Flow-Mass Curve, Hydrograph, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph Surface Water Resources of India, Environmental Flows.

**Unit III:** *Water withdrawals and uses –* Water for Energy Production, Water for Agriculture, Water for Hydroelectric Generation; Flood Control. Analysis of Surface Water Supply, Water Requirement of Crops-Crops and Crop Seasons in India, Cropping Pattern, Duty And Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to The Fields: Surface, Sub-Surface, Sprinkler and Trickle / Drip Irrigation.

*Distribution systems* - Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels- Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime Channels. Canal Outlets: Non-Modular, Semi-Modular And Modular Outlets.

**Unit IV:** *Water Logging:* Causes, Effects And Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods.

*Dams and spillways* - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

**Text/Reference Books**

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4. G L Asawa, Irrigation Engineering, Wiley Eastern
5. L W Mays, Water Resources Engineering, Wiley.

6. J. D Zimmerman, Irrigation, John Wiley & Sons
7. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 4 | Professional Core courses | BTCE-404-18 | **Transportation Engineering** | 3 | 1 | 0 | 4 |

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

**Course Outcomes**
After completing this course the student must demonstrate the knowledge and ability to:
1. Appreciate the importance of different modes of transportation and characterize the road transportation.
2. Alignment and geometry of pavement as per Indian Standards according to topography.
3. Assess the properties of highway materials in laboratory
4. Understand the importance of railway infrastructure planning and design.
5. Identify the functions of different component of railway track.
6. Outline the importance of Airport Infrastructure

**Course Content**

**Unit I:** *Introduction:* Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

*Transportation Systems:* Multi modal transportation system, Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.

**Unit II:** *Highway Development & Planning:* Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys; Highway Construction: Right of way; Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements

**Unit III:** *Railway Engineering:* History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

*Railway Track:* Requirements of a Good Track, Track Specifications, Detailed Cross-Section of Single/Double Track used in Indian Railways. Components of permanent way - Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

**Unit IV:** *Airport Engineering:* Introduction, Air Transport Scenario in India and Stages of Development, National and International Organizations; Airport planning - Site selection, runway orientation, etc. Concept of Head Wind, Cross Wind, Wind Rose Diagram, Runway Configuration.

*Aircraft Parking System & Visual Aids:* Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

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

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 5 | Professional Core courses | BTCE-405-18 | **Disaster Preparedness & Planning** | 3 | 0 | 0 | 3 |

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

**Course Outcomes**

After completing this course the student must demonstrate the knowledge and ability to:

1. Identify various types of disasters, their causes, effects & mitigation measures.
2. Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.
3. Understand the use of emergency management system to tackle the problems.
4. Discuss the role of media, various agencies and organisations for effective disaster management.
5. Design early warning system and understand the utilization of advanced technologies in disaster management.
6. Compare different models for disaster management and plan & design of infrastructure for effective disaster management.

**Content**

**Unit I:** *Introduction to Disaster Management:* Define and describe disaster, hazard, vulnerability, risk-severity, frequency and details, capacity, impact, prevention, mitigation.

*Disasters:* Identify and describe the types of natural and manmade disasters, hazard and vulnerability profile of India, mountain and coastal areas, Factors affecting vulnerability such as impact of development projects and environment modifications (including dams, land-use changes, urbanization etc.), Disaster impacts (environmental, physical, social, ecological, economic etc.); health, psycho-social issues; demographic aspects (gender,age,special needs), Lessons and experiences from important disasters with specific reference to civil engineering.

**Unit II :** *Disaster Mitigation and Preparedness:* Disaster Management Cycle-its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; Preparedness for natural disasters in urban areas.

*Risk Assessment:* Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems; Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.

**Unit III** : *Post disaster response:* Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, waste management, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.

**Unit IV:** *Integration of public policy:* Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.

**Books and References**
1. www.http//ndma.gov.in
2. http://www.ndmindia.nic.in
3. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill, Publisher
4. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92
5. Singh B.K., 2008, Handbook of disaster management: Techniques & Guidelines, Rajat Publications.
6. Disaster Management, R.B. Singh (Ed), Rawat Publications
7. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|---|---|---|---------|
| | | | | L | T | P | |
| 7 | Mandatory Courses (Non Credit) | EVS-101-18 | **Envrionmental Science** | 2 | 0 | 0 | 0 |

**\* 40 Hours are kept for various activities under the head of activities. There will be a final theory examination for the students of 50 marks but these marks will not be added to their final result as assessment will be satisfactory or non-satisfactory**

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students

Course Outcomes:

1.Students will enable to understand environmental problems at local and national level through literature and general awareness.

2.The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.

3.The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.

4.Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Detailed Contents

Unit- I : Natural Resources :Renewable and non-renewable resources

Natural resources and associated problems.Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification., Role of an individual in conservation of natural resources, Equitable use of resoureces for sustainable lifestyles.

Unit-II : Ecosystems : Concept of an ecosystem, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III : Biodiversity and its conservation : Introduction – Definition : genetic, species and ecosystem diversity, Biodiversity at global, National and local levels, Inida as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India

Unit-IV : Social Issues and the Environment : From Unsustainable to Sustainable development, Resettlement and rahabilitation of people; its problems and concerns., Environmental ethics : Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, Nuclear accidents and holocaust, Case Studies, Public awareness.

**\*ACTIVITIES**

**Nature club** (bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity

Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus. The students should be encouraged to take interest in bird watching, recognizing local plants, herbs and local animals. The students should be encouraged to appreciate the difference in the local biodiversity in their hometown, in the place of their study and other places they visit for vacation/breaks etc.

Following activities must be included.

Identify a tree fruit flower peculiar to a place or having origin from the place.Making high resolution big photographs of small creatures (bees, spiders, ants. mosquitos etc.) especially part of body so that people can recognize (games on recognizing animals/plants).Videography/ photography/ information collections on specialties/unique features of different types of common creatures.Search and explore patents and rights related to animals, trees etc. Studying miracles of mechanisms of different body systems.

**1** *(A) Awareness Activities:*

- a) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
- b) Slogan making event

- c) Poster making event

- d) Cycle rally

- e) Lectures from experts
- *f)* Plantation

- g) Gifting a tree to see its full growth
- h) Cleanliness drive
- h) Drive for segregation of waste
- i) To live with some eminent environmentalist for a week or so to understand his work vi) To work in kitchen garden for mess
- j) To know about the different varieties of plants
- k) Shutting down the fans and ACs of the campus for an hour or so

- l) Visit to a local area to document environmental assets

  river/forest/grassland/hill/mountain/lake/Estuary/Wetlands

- m) Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- n) Visit to a Wildlife sanctuary, National Park or Biosphere Reserve

**References & Books**
1.  Textbook of Environmental studies, Erach Bharucha, UGC
    Weblink: https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2.  Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd
3.  Environment Biology by Agarwal, K. C., Nidi Publ. Ltd. Bikaner.
4.  Principle of Environment Science by Cunninghan, W.P.
5.  Essentials of Environment Science by Joseph.
6.  Perspectives in Environmental Studies by Kaushik, A.
7.  Elements of Environment Science & Engineering by Meenakshi.
8.  Elements of Environment Engineering by Duggal.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 6 | Professional Core courses | BTCE-406-18 | **Concrete Testing Lab** | 0 | 0 | 2 | 1 |

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

**Course Outcomes**
1. Evaluate properties of building materials, such as cement and aggregates.
2. Conduct experiments and check the acceptance criteria (if any).
3. Design concrete mixes as per BIS provisions.
4. Analyze the properties of concrete in fresh and hardened state.
5. Create a well organized document and present the results appropriately.
6. Understand and apply non destructive testing (NDT) for evaluating concrete quality.

**Content**
1. Tests on cement
   - Fineness
   - Consistency
   - Setting time
   - Soundness
   - Specific gravity
   - Strength
2. Tests on aggregates (fine and coarse)
   - Specific gravity
   - Bulk Density
   - Fineness Modulus
   - Moisture content
   - Water Absorption
   - Bulking of sand
3. Design mix of concrete as per BIS method.
4. Workability tests on concrete
   - Slump test
   - Compaction Factor test
   - Vee-Bee test
5. Strength tests on concrete
   - Compressive strength (Cube and Cylinder)
   - Split Tensile strength
   - Flexural strength
   - Abrasion resistance
6. Non-Destructive Techniques
   - Rebound hammer test
   - Ultra sonic pulse velocity test

**Text/Reference Books**
1. 'Concrete Lab Manual', M. L. Gambhir, Dhanpat Rai & Sons, New Delhi.
2. 'Concrete Lab Manual', TTTI Chandigarh.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|----|----|----|---------|
| | | | | L | T | P | |
| 7 | Professional Core courses | BTCE-407-18 | **Transportation Lab** | 0 | 0 | 2 | 1 |

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

**Course Outcomes**
After completing this course the student must demonstrate the knowledge and ability to:
1. Characterize the pavement materials as per the Indian Standard guidelines.
2. Evaluate the strength of subgrade soil by CBR test.
3. Conduct experiments to evaluate aggregate properties.
4. Determine properties of bitumen material and mixes
5. Evaluate the pavement condition by rough meter and Benkelman beam test.
6. Create a well organized report and present the results appropriately

**Course Content**
I *Tests on Sub-grade Soil*
1.. California Bearing Ratio Test

II *Tests on Road Aggregates*
2. Crushing Value Test
3. Los Angles 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. Study of Roughometer/Bump Indicator
12. Study of Benkelman Beam Method

**References**
Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", NemChand andBrothers, Roorkee.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 10 | Professional Skill enhancement | BTCE-432-18 | **Training-II** | - | - | - | 1 |

**Content**

Module I – Survey camp of an area (2 weeks)

1. Hands-on-training of modern surveying equipment such as Digital Theodolite, Total Stations, Autolevel, and GPS.
2. On-site application of traversing, etc. for preparation of topographical maps of an area.

Module II – 4 week Summer Internship in Industry/ Construction site/ Appropriate workplace

**Note:**

1. The students need to submit a topographical maps preaperd in Survey Camp and a report of the summer internship.
2. The viva exam for the subject will be conducted alongwith the practical exams of the End-Semster Examination of Fifth Semester.

| S. No. | Category | Code | Course Title | Hours per week | | | Credits |
|--------|----------|------|--------------|---|---|---|---------|
| | | | | L | T | P | |
| 10 | Professional core | BMPD-401-18 | **Mentoring and professional development** | - | - | 2 | 0 |
| | | | | | | | |

**Guidelines regarding Mentoring and Professional Development**

The objective of mentoring will be development of:

• Overall Personality

• Aptitude (Technical and General)

• General Awareness (Current Affairs and GK)

• Communication Skills

• Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

**Part – A (Class Activities)**

1. Expert and video lectures

2. Aptitude Test

3. Group Discussion

4. Quiz (General/Technical)

 5. Presentations by the students

6. Team building Exercises

**Part – B (Outdoor Activities)**

1. Sports/NSS/NCC

2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B.

Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.