**STUDENT’S HANDBOOK 2014-2015**

Vision, Mission, Program Educational Objectives (PEOs), Program Specific Outcomes

(PSOs), Program Outcomes (POs), Study Scheme and Course Outcomes (COs)



Department of Civil Engineering

Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib

**VISION OF THE INSTITUTE**

To evolve as an eminent Centre of Learning with total commitment to provide career-focused technical training aimed at excellence in inter-disciplinary education, research and innovation in order to produce socially responsible and synergetic leaders with a global profile.

**MISSION OF THE INSTITUTE**

The Baba Banda Singh Bahadur Engineering College seeks to enrich the academic experience of students to help them meet the evolving needs of society. We aspire to realise our Vision as follows:

* Conduct UG programs that integrate global awareness, communication skills and team building across the curriculum.
* Run Graduate education programs to prepare students for inter-disciplinary engineering, research and advanced problem solving with focus on career advancement.
* Provide an atmosphere to facilitate personal commitment to the educational success of students in an environment that values diversity and community.
* Inculcate a high regard for ethical principles and an understanding of human and environmental realities.
* Provide state-of-the-art facilities and effective delivery of high-quality content by qualified faculty members to build the notion of lifelong learning.
* Conduct scholarly activities that create and transfer cutting-edge knowledge in the area of engineering and technology
* Create a highly successful alumni base that contributes to the global society.

**VISION OF DEPARTMENT**

The department endeavour to be acknowledged internationally for outstanding education and research to fulfil the needs of society at large. Our vision is to become a centre of excellence in providing the technical education & research in the emerging area of Civil engineering**.**

**MISSION OF DEPARTMENT**

* To impart quality education to the students of Civil engineering to excel in their lives and livelihood.
* To develop professional potential for society.
* To develop state-of-the-art research facilities for stakeholders to excel in globally competitive world.
* To develop associations with R&D organizations, industries and educational institutes for eminence research, consultancy and teaching.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

PEO 1: To teach with the motive to instill key concepts of all courses being taught along with exposure to projects, so that students develop strong foundation of knowledge to rely upon while working with problems in their professional life.

PEO 2: To impart sufficient knowledge of CAD, structural analysis, estimation & costing and project management software, so that students have self-confidence while working with any software tool as per the requirement of their job profile.

PEO 3: To inculcate learning attitude in civil engineering students, so that they continue to update their knowledge about the latest trends/technology relevant to their area of specialization for sustainable and eco-sensitive infrastructure development.

**PROGRAM SPECIFIC OUTCOMES (PSOs)**

PSO 1: Graduating civil engineers will be able to understand and analyze the problem at hand and will make use of problem solving skills mastered during the under graduation study by using appropriate techniques for effective and efficient solution of the problem in whatever field of civil engineering they will work.

PSO 2: Graduating civil engineers will apply with confidence the appropriate software tools for speedy, accurate and effective solutions of the design problems and will also make best use of the available infrastructure and human resources to ensure the on time delivery of the projects by implementing latest project management techniques.

PSO 3: Graduating civil engineers would endeavour to find solution of all infrastructure projects with due consideration for applicable bylaws, codes, health & environment constraints so as to contribute for the betterment of quality of life.

**PROGRAM OUTCOMES (POs)**

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental

considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research

methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern

engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess

societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to

the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader

in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and

leader in a team, to manage projects and in multidisciplinary environment

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|  **THIRD SEMESTER Contact Hours: 33 Hrs.** |
| **Code** | **Course Code** | **Course Name** | **Load Allocation** | **Marks Distribution** | **Total****marks** | **Credits** |
| L | T | P | Internal | External |
| CEC201 | BTAM-301 | Engineering Mathematics-III\* | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC202 | BTCE-301 | Fluid Mechanics-I | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC203 | BTCE-302 | Rock Mechanics & Engg. Geology | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC204 | BTCE-303 | Strength of Materials | 3 | 2 | - | 40 | 60 | 100 | 5 |
| CEC205 | BTCE-304 | Surveying | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC206 | BTCE-305 | Building Materials & Construction | 4 | 0 | - | 40 | 60 | 100 | 4 |
| CEC207 | BTCE-306 | Fluid Mechanics-I Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC208 | BTCE-307 | Strength of Materials Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC209 | BTCE-308 | Surveying Lab | - | - | 3 | 30 | 20 | 50 | 2 |
| CEC210 | BTCE-309 | Workshop Training of 4 weeks duration after 2nd semester Carpentry, Electrical, Plumbing,Masonry, CAD | 30 | 20 | 50 | 1 |
|  Total | 20 | 06 | 07 | 360 | 440 | 800 | 31 |

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| **FOURTH SEMESTER Contact Hours: 30 Hrs** |
| **Code** | **Course Code** | **Course Name** | **Load Allocation** | **Marks Distribution** | **Total****marks** | **Credits** |
| L | T | P | Internal | External |
| CEC211 | BTCE-401 | Geomatics Engineering | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC212 | BTCE-402 | Construction Machinery & Works Management | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC213 | BTCE-403 | Design of Concrete Structures-I | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC214 | BTCE-404 | Fluid Mechanics-II | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC215 | BTCE-405 | Irrigation Engineering-I | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC216 | BTCE-406 | Structural Analysis-I | 3 | 2 | - | 40 | 60 | 100 | 5 |
| CEC217 | BTCE-407 | Concrete Technology Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC218 | BTCE-408 | Structural Analysis Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC219 | BTCE-409 | General Fitness | 100 | - | 100 |  |
|  Total | 19 | 07 | 04 | 400 | 400 | 800 | 28 |

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| **FIFTH SEMESTER Contact Hours: 30 Hrs** |
| **Code** | **Course Code** | **Course Name** | **Load Allocation** | **Marks Distribution** | **Total****marks** | **Credits** |
| L | T | P | Internal | External |
| CEC301 | BTCE-501 | Design of Steel Structures-I | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC302 | BTCE-502 | Geotechnical Engineering | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC303 | BTCE-503 | Structural Analysis-II | 3 | 2 | - | 40 | 60 | 100 | 5 |
| CEC304 | BTCE-504 | Transportation Engineering-I | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC305 | BTCE-505 | Environmental Engineering –I | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC306 | BTCE-506 | Transportation Engineering Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC307 | BTCE-507 | Geotechnical Engineering Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC308 | BTCE-508 | Computer Aided Structural Drawing I | - | - | 3 | 30 | 20 | 50 | 2 |
| CEC309 | BTCE-509 | Survey Camp of 04 weeks duration after 4th Semester |  |  |  |  |
| Total | 17 | 06 | 07 | 390 | 410 | 800 | 29 |

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| **SIXTH SEMESTER Contact Hours: 34 Hrs** |
| **Code** | **Course Code** | **Course Name** | **Load Allocation** | **Marks Distribution** | **Total****marks** | **Credits** |
| L | T | P | Internal | External |
| CEC310 | BTCE-601 | Design of Concrete Structures-II | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC311 | BTCE-602 | Elements of Earthquake Engineering | 3 | 2 | - | 40 | 60 | 100 | 5 |
| CEC312 | BTCE-603 | Foundation Engineering | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC313 | BTCE-604 | Numerical Methods in Civil Engineering | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC314 | BTCE-605 | Professional Practice | 3 | 2 | - | 40 | 60 | 100 | 5 |
| CEC315 | BTCE-606 | Environment Engineering –II | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC316 | BTCE-607 | Environmental Engineering Lab | - | - | 2 | 30 | 20 | 50 | 1 |
| CEC317 | BTCE-608 | Computer Aided Structural Drawing II | - | - | 3 | 30 | 20 | 50 | 2 |
| CEC318 | BTCE-609 | General Fitness |  |  |  | 100 |  | 100 |  |
|  Total | 21 | 08 | 5 | 400 | 400 | 800 | 32 |

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| **SEVENTH / EIGHT SEMESTER** |
| **Code** | **Course Code** | **Course Name** | **Load Allocation** | **Marks Distribution** | **Total****marks** | **Credits** |
| L | T | P | Internal | External |
| CEC401 | BTCE-701 | Software Training\* | - | - | - | 150 | 100 | 250 | 10 |
| Industrial Training | 300 | 200 | 500 | 20 |
| Total |  |  |  | 450 | 300 | 750 | 30 |

**\*List of Software for Training to be learnt during Training Period**

**Any software that enhances professional capability in civil engineering practice a partial indicative list is mentioned below:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1. GT STRUDAL** | **2. PRIMA VERA** |  |  |  |  |  |  |  |  |  |  |
| **3. GEOTECH** |  | **4. ARCVIEW GIS** |  |  |  |  |  |  |  |  |
| **5. GEO 5** |  | **6. GEO STUDIO PROF 2004** |  |  |  |  |  |  |
| **7. AUTOCAD CIVIL 3D** | **8. MX ROAD** |  |  |  |  |  |  |  |  |  |  |  |
| **9. GEOMATIC** | **10. STAAD PRO** |  |  |  |  |  |  |  |  |  |  |
| **11. HDM-4** |  | **12. PLAXIS** |  |  |  |  |  |  |  |  |  |  |  |
| **13 Any other relevant software** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **SEVENTH / EIGHT SEMESTER** |
| **Code** | **Course Code** | **Course Name** | **Load Allocation** | **Marks Distribution** | **Total****marks** | **Credits** |
| L | T | P | Internal | External |
| CEC402 | BTCE-801 | Design of Steel Structures-II | 4 | 1 | - | 40 | 60 | 100 | 5 |
| CEC403 | BTCE-802 | Disaster Management | 4 | 0 | - | 40 | 60 | 100 | 4 |
| CEC404 | BTCE-803 | Irrigation Engineering-II | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC405 | BTCE-804 | Transportation Engineering-II | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC406 | BTCE-**810** | Ground Improvement Techniques | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC407 | BTCE-818 | Pavement Design | 3 | 1 | - | 40 | 60 | 100 | 4 |
| CEC408 | BTCE-80**5** | Project |  |  | 6 | 100 | 50 | 150 | 3 |
| CEC409 |  | **General Fitness** | 100 | - | 100 |  |
| Total | **20** | 05 | 06 | 440 | 410 | 850 | 28 |

**COURSE OUTCOMES(COs)**

**BTCE -301 Fluid mechanics -1**

CO1: Understand the basic properties of Fluid and solving practical problems.

 CO2: Compute hydrostatic forces on submerged bodies.

CO3: Analyze flow rates, velocity, energy losses and momentum flux for fluid system.

CO4: Apply the principles of Bernoulli's equation in measurement of discharge in pipes, and in other pipe flow problems.

CO5: Evaluate relationship among various parameters based on dimension analysis and model study.

CO6: To predict the resisting forces on moving submerged body.

**BTCE-302 Rock Mechanics & Engg. Geology**

CO1. Gain knowledge of geology and its variety.

CO2. Study weathering, minerals, rocks, and rock formations in relation to civil engineering structure

CO3. Learn skills to find out engineering properties of rock.

CO4. Apply knowledge and finding result for various test applications

CO5. Outline the characteristics and properties of various rocks.

CO6. To gain knowledge about various geological problems.

CO7. To solve geological engineering problems.

**BTCE-303 Strength of Material**

 CO1. Apply the linear laws of elasticity as related to stress and strain and analyse on different types of sections

 CO2. Understand the concept of a complex stress system.

CO3. Understand of the behavior of columns and struts under axial loading.

CO4. Analyse the bending moment and shear force on different types of beams.

CO5. Determine the effect of combined axial and bending stress.

CO6. Analysis and design of shafts based on strength, stiffness and determine the effect of combined bending and torsion.

**BTCE-304 Surveying**

CO1. To Train a Student in a manner in which they will have an ability to collect field data

CO2. To prepare plan or map of the area surveyed

CO3. To analyse and to calculate the field parameters for setting out operation of actual engineering works.

CO4. To set out field parameters at the site for further engineering works.

CO5. Students will have an understanding of professional and ethical responsibility.

**BTCE-305 Building Material & Construction**

CO1. Identify and characterize building materials

CO2. Understand the manufacturing process of bricks, cement,concrete and appropriate methods for preservation of timber.

CO3. Outline the characteristics, properties and applications of materials used in construction.

CO4. Evaluate the quality of building material through visual inspection or by laboratory testing.

CO5. Apply the knowledge to select suitable construction techniques for different building components.

**BTCE- 306 Fluid mechanics lab**

**CO1:** Predict the metacentric height of floating vessel and utility in vessel design.

**CO2:** Calibrate various flow measuring devices (venturimeter, orifice meter and notches).

**CO3:** Authenticate the Bernoulli’s theorem experimentally.

**CO4:** Assess the discharge of fluid over broad crested weir.

**CO5:** Compute various losses and velocity in pipe flow in field

**BTCE-307 STRENGTH OF MATERIALS LAB**

**Students are able to:**

CO1. Apply the linear laws of elasticity as related to stress and strain.

CO2. Differentiate between properties of different materials.

CO3. Analyze the bending stress on different types of sections.

CO4. Understand and apply the concepts of laws of elasticity with respect to stress and strain.

CO5. To understand the properties of different materials.

CO6. Perform different tests i.e. tensile, compression, torsion, hardness, bending and impact test.

CO7. Can understand the concept of deflection in beams.

**BTCE – 308 Survey Lab**

CO1. To Train a Student in a manner in which they will have an ability to collect field data.

CO2. To prepare plan or map of the area surveyed.

CO3. To analyze and to calculate the field parameters for setting out operation of actual engineering works.

CO4. To set out field parameters at the site for further engineering works.

CO5. Students will have an understanding of professional and ethical responsibility

**BTCE-401 GEOMATICS ENGINEERING**

 On completion of this course, the student shall be able to:

CO1. Acquire knowledge about photogrammetry principles, methods and product generation strategies in both Analytical and digital Photogrammetry system.

CO2. Understand the problem related to generation of products and solving them.

CO3. Acquire knowledge about the principles and physics of Remote sensing and data acquisition.

CO4. Understand the data models and data structures used for spatial data.

 CO5. Understand the working principle of GPS, it’s components, signal structure, and error sources.

CO6. Understand various GPS surveying methods and processing techniques used in GPS observations.

CO7. Familiarise various areas of GPS applications and new developments.

**BTCE-402 Construction Machinery and Work Management**

CO1. Device a plan and manage construction project and know the time value of money.

CO2. Plan project by various methods finding the time estimates and controlling the projects while finding the critical path.

CO3. Determine minimum total cost of project in minimum time by crashing the activities and hence updating and rescheduling of a project.

CO4. Make aware of various construction and hoisting equipment.

**BTCE-403 Design of concrete structures -1**

CO1. Understand the properties and role of various constituent materials used in concrete making.

CO2. Understand the properties of concrete and various design mix techniques for concrete.

CO3. Apply the fundamental concepts, techniques in analysis and design of reinforced concrete elements i.e. beam & slab.

CO4. Apply the design principles by undertaking simple design examples.

CO5. Apply the various codal requirements related to RC members i.e. slab & beam.

CO6. Exposure to the designing methods and codal recommendations to the students.

**BTCE-404 Fluid mechanics -2**

**CO1:** Distinguish and identify different types of fluid flow.

**CO2:** Formulate equation of flow through different media/obstructions for a laminar and turbulent flow.

**CO3:** Apply the principles of conservation of energy and momentum in the flow studies **CO4:** Design pipe network and open channels for passing a given discharge.

**CO5.** Evaluate the effect of channel shapes on the discharge parameters.

**CO6**. Understand and apply the theory of hydraulic jumps and surges.

 **BTCE-405 Irrigation Engineering –I**

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

CO1. Identify the basic understanding of soil water plant relationship.

CO2. Understand different irrigation techniques and the related theories.

CO3. Apply different theories/methods to design lined and unlined canals.

CO4. Estimate the yield of tube-well using different formulae.

CO5. Design different hydraulic structures required for effective river training works.

CO6. Demonstrate the knowledge related to the water logging, losses, economics of lining, etc.

CO7. To train the students and develop basic understanding of soil water plant relationship and select and design appropriate method of water application in varied situations.

**(BTCE-406) Structure Analysis –1**

CO1. To study the concepts of loads, supports and displacements.

CO2. To understand the concepts and theorms of structures for analysis.

CO3. Analyze statically determinate structural systems.

CO4. Choose a suitable technique for determination of structural displacement and force resultants.

CO5. Study the effect of loads, rolling loads and/or reactions, support displacements and temperature on the structural response.

CO6. To study the Concept of influence lines for deciding the critical forces and

 sections while designing.

**(BTCE-407): Concrete Technology Lab**

 CO1: Explain the properties of constituent material of concrete.

 CO2: Carry out concrete mix design.

 CO3: Carry out test procedures for major laboratory properties of fresh and hardened concrete.

 CO4: Test the constituents used in concrete.

 CO5: To make the students handy on the testing machines used in the industry.

 CO6: To make the students industry fit quality control engineer.

**(BTCE-408) Structure Lab**

Students studying this course should be able to:-

CO1: Verify theoretical formulas by conducting the experiments.

CO2: Analyze statically determinate beams, trusses.

CO3: Visualize and analyze arch structures.

CO4: Obtain the influence lines for statically determinate and indeterminate structures.

CO5: Determine deflections of beams and frames experimentally and validate using classical methods.

CO6: Understand the beam behavior under unsymmetrical bending condition.

**(BTCE-501) Design of Steel Structures-I**

CO1. Understand and appreciate various aspects of steel construction like different types of steel sections, their specifications, advantages of steel construction etc.

CO2. Analyse and design various types of steel connections using rivets, bolts and weld.

CO3. Design basic elements of a steel building like beam, column, and column bases etc. for given conditions and loading.

CO4. Estimate ‘design loads’ for a roof truss and then be able to design its various components like top chord members, bottom chord members, web members, purlins etc.

**BTCE-502 GEOTECHNICAL ENGINEERING**

CO1. Understand the origin of soil and to identify different types of soil.

CO2. Introduce soil as three-phase system, index properties and engineering classification methods of soils.

CO3. Study flow through soils (permeability) and influence of presence of water on engineering properties of soil.

CO4. Study compressibility characteristics (compaction and consolidation) of soils and estimate settlements. To study variation of geostatic stresses and stress due external load in soils.

CO5. Study methods of determination of shear strength of soils and factors influencing its magnitude.

**(BTCE-503) Structural Analysis-II**

Students studying structure analysis –II should be able to:

CO1: Understand the concept of Static and kinematic indeterminacies and stability of structural systems.

CO2: Understand the concept of Pin-jointed and rigid-jointed sway / non sway, statically determinate and redundant structural systems.

CO3: Visualize and understand the concept of support settlement, Lack of fit and temperature variation on the structural response.

CO4: Select an efficient and effective analysis method for the analysis of redundant structures.

CO5: Study the concept of Influence line for bar forces in the statically indeterminate beams and frames and trusses.

CO6: Apply the concept of influence lines for deciding the critical forces and sections while analysis.

**(BTCE-504) Transportation Engineering-I**

 CO:1 Understand the importance & characteristics of road transport

 CO:2 To known about the history of highway development, surveys and classification of road.

 CO:3 To study about the geometric design of highways

 CO:4 To study about pavement materials

 CO:5 To study about construction of various types of roads and identify the problems associated with rods & remedies for same.

 CO:6 The traffic characteristics, interpretation of traffic data & its uses, traffic safety & various control measures and traffic environment interaction for safe & healthy environment

 **(BTCE-505) Environmental Engineering-I**

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

CO1.Serve the community by making people aware with the different pollution related problems.

CO2. Identify different types of water demands and select suitable source of water.

CO3. Predict future population and estimate future water demands.

CO4. Demonstrate a firm understanding of various water quality parameters.

CO5. Help in the prevention of water borne disease thus improving the health conditions of the people.

CO6. Design different water treatment units to meet the drinking water quality standards and criteria.

CO7. Plan and design the water transportation, pumping stations and pipe network

CO8. Design low cost water treatment techniques in the rural areas.

**(BTCE-506) Transportation Engineering Lab**

CO1: Characterize the pavement materials as per the Indian Standard guidelines.

CO2: Evaluate the strength of sub grade soil by CBR test.

CO3: Conduct experiments to evaluate aggregate properties.

CO4: Determine properties of bitumen material and mixes

CO5: Evaluate the pavement condition by rough meter and Benkelman beam test.

CO6: Create a well-organized report and present the results appropriately.

**(BTCE-507) GEOTECHNICAL ENGG. LAB**

1. To understand the origin of soil and to identify different types of soil.

2. To understand the various physical and engineering characteristics of different types of soil.

3. To understand the concept of slope stability.

4. To appreciate the use of modern technology in the field of geotechnical engineering

**(BTCE-508) COMPUTER AIDED STRUCTURAL DRAWING-I**

CO1. Produce structural drawing of reinforced concrete element such as:

a. Beam

b. Slab.

CO2. Develop structural drawings of steel elements such as:

a. Tension member

b. Compression member

c. Beam Column base

d. Roof Trusses.

CO3. Various connection / Joint Details

**(BTCE-601) DCS-II**

 CO1. Design various sub-structure components like isolated footing, combined footing, along

 with relevant IS code requirements.

CO2. To introduce codal provisions of IS: 3370 for design of water tanks.

CO3. Design of retaining walls, along with relevant IS code requirements.

CO4. Design various super-structure components like stairs, columns, continuous beams, along with relevant IS code requirements.

CO5. Apply the concepts of structure design to special structural elements like curved beams, domes, water retaining structures, along with relevant IS code requirements.

CO6. To undertake design problems of water tanks.

**BTCE-602 Elements of Earthquake Engineering**

CO1. Study and Understand the nature of seismic forces in structural designing of structure and factor related to the design of buildings considering seismic forces.

CO2. To create an ability to get information from past structural failures due to seismic force and use it in future planning.

CO3. Analysis of lateral forces and vibrations.

CO4. Application and create a platform for others to join the research regarding seismic forces.

CO5. Give and pertain various provisions of code related to the seismic design of buildings

**BTCE – 603 Foundation Engineering**

On completion of this course, the student shall be able to

CO1. Understand the site investigation, methods and sampling.

CO2. Get knowledge on bearing capacity and testing methods.

CO3. Design shallow footings.

CO4. Determine the load carrying capacity, settlement of pile foundation.

CO5. Determine the earth pressure on retaining walls and analysis for stability.

**(BTCE-604) Numerical Methods in civil Engineering**

CO I. Understanding and representing the functions and wave forms as Fourier Series and studying the Laplace transforms of various functions.

CO II. Understanding the analytic functions of complex variable and determining conjugate functions in different engineering applications.

CO III. Formulating and solving the ordinary and partial differential equations needed to model the engineering problems.

CO IV. Analyzing the data statistically, fit various types of probability distributions and testing the hypothesis for small samples**.**

**(BTCE-605) Professional Practice**

CO1: Prepare general and detailed specifications of different civil engineering works.

CO 2.: Formulate rough and detailed building estimates

CO 3: Compute the quantity of materials required for civil engineering works as per the specifications

CO 4: Evaluate contracts and tenders pertaining to construction practices

CO5: Analyse rates for the items not covered in CSR.

CO6: Demonstrate the knowledge related to various rules and regulation applicable to construction industry.

**(BTCE-606) Environmental Engineering-II**

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

CO1. Demonstrate a firm understanding of various sewerage systems and their suitability.

CO2. Design sewer and drainage systems layout for communities.

CO3. Design a sewerage system for the town and would assist in the design of wastewater treatment plants.

CO4. Evaluate the waste water characteristics to determine the degree of treatment required.

CO5. Explain the physical, chemical and biological techniques of wastewater treatment.

CO6. Compare the applicability of treatment technologies under different conditions..

CO7. Design the treatment units and assess the efficacy of an entire treatment system

CO8. Ability to make decisions regarding the treatment plant site selection, operation and maintenance and the need of advanced treatment.

**(BTCE-607) Environment Engineering Lab**

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

CO1. Conduct experiments as per standard methods of sampling and analysis.

CO2. Demonstrate the expertise to characterize water and wastewater samples.

CO3. Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.

CO4. Record the experimental observations and interpret the analysis results.

CO5. Use the analysis results for making informed decisions about the drinkability of water and disposal of wastewater.

CO6. Evaluate and compare different techniques of experimental analysis.

CO7. Evaluate the efficiencies of the water and wastewater treatment plants.

CO8. Make decisions regarding dosing of different chemicals involved in water treatment processes.

 **(BTCE-608)** Computer **Aided Structural Drawing – II**

CO1. Design and draw working structural drawings of staircase, foundation, domes and water retaining structures.

CO2. Understand and interperate design aids and handbooks.

CO3. Use of relevant Indian Standard specifications applicable to Reinforced concrete structures.

CO4. To expose students to the architectural and building drawings concepts.

CO5. To impart knowledge of constructional details of different building components.

CO6. To impart the ability to work with an architect and contractor.

**(BTCE-801) Design of Steel Structures-II**

CO1. Consider various primary loads, load combinations for obtaining a worst design load.

CO2. Plan the structural framing of industrial buildings and bridges from the given data/design constraints.

CO3. Apply the concepts of structural design to obtain suitable member sizes of sections.

CO4. Prepare rough sketches to the draftsman.

CO5.To design plate girders and steel structures such as roof trusses and building frames for industrial buildings.

CO6. To analyze and design various types of steel bridges.

**(BTCE-802) Disaster Management**

CO1. Understand genesis and causes of natural and manmade disaster within the framework

of fundamental concepts of basic sciences and engineering.

CO2. Perceive the vulnerability of their living and working places and level of preparedness

within the existing setup of disaster management to create vulnerability and risk maps.

CO3. Analyze and critically examine the vulnerability of a region and to employ adequate

strategy and tools of intervention.

CO4. Build capacity to use specialized problem solving skills, methodologies and

technology.

CO5. Design early warning system and understand the utilization of advanced technologies

in disaster management.

CO6. Compare different models for disaster management and plan &amp; design of

infrastructure for effective disaster management.

**(BTCE - 803) Irrigation Engineering –II**

Students studying Irrigation Engineering –II should be able to:

CO1: Study investigations and functioning of Diversion Headwork

CO2: Understand the concept of seepage force and determination of uplift pressure under the Irrigation engineering structures.

CO3: Understand the various failures of irrigation engineering structures.

 CO4: Understand the overall concept of hydraulic jump, energy dissipation and energy dissipation devices.

CO5: Understand the necessity, location and type of various irrigation engineering structures.

CO6: Analysis and design various irrigation engineering structures such as weirs, canal regulators, falls, cross drainage works and outlet.

CO7: Study and understand the concept of water distribution system with the help of various irrigation structures.

**(BTCE-804) Transportation Engineering – II**

 CO1: Learn various concepts of railway tracks & its components.

 CO2: Employ Railway Track specifications and perform geometric design of the railway track.

 CO3: Aware of the current international technology relative to Railway Engineering.

 CO4: Develop an awareness of major issues and problems of current interest to the Airport Engineering.

 CO5: Determine the runway orientation and the runway length as per FAA & ICAO guidelines.

**Ground Improvement Techniques ( BTCE- 808 )**

CO1. Understand the concepts behind various ground improvement techniques.

CO2. Identify appropriate techniques for various ground conditions.

CO3. Predict the behaviour of ground after improvement.

**Pavement Design (BTCE-818)**

CO:1 To study different types of pavements along with functions of different components

CO:2 To consider various factors including load and climatic factors for design.

 CO:3 Design pavement and overlays as per need and field condition.

 CO:4 To study and design the types of joints and their necessity in pavements.

 CO:5 Design bituminous mix as per Indian standard.

 CO:6 To study modern techniques in pavements.