| Design of Steel Structures | | Semester | 7 |
|---|---|---|---|
| Course Code | **BCV701** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:2:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 hours Theory + 8-10 Lab slots | Total Marks | 100 |
| Credits | 04 | Exam Hours | 3 |
| Examination nature (SEE) | Theory/practical | | |

**Course objectives:**

1. Understand the behaviour of structural elements in steel structures and well versed with Steel design principles according to the guidelines of IS: 800-2007.
2. Apply their knowledge of Structural mechanics to analyse and design the steel structures.
3. Design the steel structural elements of different forms and connections under different stresses.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Chalk and Talk
2. Use Power point presentation
3. Visit an Industrial Building Construction site.

**MODULE-1**

**Introduction:** Advantages and Disadvantages of Steel Structures, Limit state method Limit State of Strength, Structural Stability, Serviceability Limit states, Failure Criteria of steel, Design Consideration, Loading and load combinations, IS code provisions, Specification and Section classification.

**Plastic Behavior of Structural Steel:** Introduction, Plastic theory, Plastic Hinge Concept, Plastic collapse load, load factor, Shape factor, Theorem of plastic collapse, Methods of Plastic analysis.

**MODULE-2**

**Bolted Connections:** Introduction, Types of Bolts, Behavior of bolted joints, Design of High Strength friction Grip (HSFG) bolts, Design of Simple bolted Connections (Lap and Butt joints) and bracket connections both types

**MODULE-3**

**Welded Connections:** Introduction, Types and properties of welds, Effective areas of welds, Weld Defects, Simple welded joints for truss member and Bracket connections both types. Advantages and Disadvantages of Bolted and Welded Connections.

**MODULE-4**

**Design of Tension Members:** Introduction, Types of Tension members, Slenderness ratio, Modes of Failure, Factors affecting the strength of tension members, Design of Tension members with Lug angles.

**Design of Column Bases:** Design of Simple Slab Base and Gusseted Base.

**MODULE-5**

**Design of Compression Members:** Introduction, Failure modes, Behavior of compression members, Sections used for compression members, Effective length of compression members, Design of compression members and built up Compression members, Design of Laced and Battened Systems.

**PRACTICAL COMPONENT OF IPCC** *(May cover all / major modules)*

| Sl.NO | Experiments |
|---|---|
| 1 | Design a Bolted Connections using M S Excel |
| 2 | Design a welded Connections using M S Excel |
| 3 | Design of Tension members using M S Excel |
| 4 | Design of Compression Members using MS Excel |
| 5 | Design of Simple Slab Base using M S excel |
| 6 | Design of Gusseted Base using M S Excel |
| 7 | Draw the following using AutoCAD.<br>Column bases and Gusseted bases with bolted and welded connections. |
| 8 | Draw the following using AutoCAD.<br>Roof Truss – Welded and Bolted |
| 9 | Draw the following using AutoCAD.<br>Connections – Beam to beam, Beam to Column by Bolted and Welded Connections. |
| 10 | Draw the following using AutoCAD.<br>Built-up Columns with lacings and battens. |
| 11 | Drawing of Gantry Girder for the given data using AutoCAD. |
| 12 | Drawing of Welded Plate girder for the given data using Auto CAD. |

**Course outcomes (Course Skill Set):**

At the end of the course, the student will be able to:

1. Explain: the engineering properties and the behaviour of steel structural elements according to the guidelines. L - 2
2. Analyse and design: Structural connection of Steel Elements. L-4 & L-5
3. Analyse and design: the steel structural elements of different forms under different stresses. L-4 & L-5

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CIE for the theory component of the IPCC (maximum marks 50)**

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

**CIE for the practical component of the IPCC**

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous

evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.

- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

**SEE for IPCC**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

**The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component**.

**Suggested Learning Resources:**

**Books**

1. N Subramanian, "Design of Steel Structures", Oxford University Press, New Delhi, India.
2. S K Duggal, "Limit State Design of Steel Structures" McGraw Hill Publications Chennai.

**Web links and Video Lectures (e-Resources):**

https://nptel.ac.in/courses/105105162

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning:**

Develop a Models of the following connections:

1. Lap Joint, But Joint (bolted and welded)
2. Angle connected to Gusset plate
3. Plate Connected to gusset plate
4. Beam to beam connections
5. Beam to Column Connection
6. Built up Column with lacings and Battens.

| ESTIMATION AND CONTRACT MANAGEMENT | | Semester | VII |
|---|---|---|---|
| Course Code | BCV702 | CIEMarks | 50 |
| TeachingHours/Week(L:T:P:S) | 3:2:0:0 | SEEMarks | 50 |
| TotalHoursofPedagogy | 40hoursTheory | TotalMarks | 100 |
| Credits | 04 | ExamHours | 03 |
| Examinationnature(SEE) | Theory | | |

**Course Learning Objectives:** This course will enable students to;

- Estimate the quantities of work, develop the bill of quantities and arrive at the Cost of civil engineeringProject
- Understand and apply the concept of Valuation for Properties
- Understand, Apply and Create the Tender and Contract document.

**Teaching-Learning Process(General Instructions)**

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching/power point presentation
2. Regular review of the students by asking questions based on topics covered in the class

**MODULE-1**

**Quantity Estimation for Building:** study of various drawing attached with estimates, important terms, units of measurements, abstract, Types of estimates. Estimation of building by Short wall and long wall method - centreline method.

Estimate of R.C.C structures including Slab, beam, column, footings.

**MODULE-2**

Estimate of Steel truss, manhole and septic tanks and slab culvert.

**Quantity Estimation for Roads:** Computation of volume of earthwork fully in banking, cutting, partly cuttingand partly Filling by mid-section, trapezoidal and Prismoidal Methods.

**MODULE-3**

**Specification for Civil Engineering Works:** Objective of writing specifications essentials in specifications, general and detail specifications of different items of works in buildings and roads.

**Analysis of Rates :** Factors Affecting Cost of Civil Works , Concept of Direct Cost , Indirect Cost and Project Cost

Rate analysis and preparation of bills, Data analysis of rates for various items of Works, Sub-structure components, Rate analysis for R.C.C. slabs, columns and beams.

**MODULE-4**

. **Contract Management-Tender and its Process:** Invitation to tender, Prequalification, administrative approval& Technical sanction. Bid submission and Evaluation process. Contract Formulation: Letter of intent, Award of contract, letter of acceptance and notice to proceed. Features / elements of standard Tender document (source: PWD / CPWD / International Competitive Bidding – NHAI / NHEPC / NPC).

Law of Contract as per Indian Contract act 1872, Types of Contract, Joint venture.

**Contract Forms:** FIDIC contract Forms, CPWD, NHAI, NTPC, NHEPC

**MODULE-5**

**Contract Management-Post award :**Basic understanding on definitions, Performance security, Mobilization and equipment advances, Secured Advance, Suspension of work, Time limit for completion, Liquidated damages and bonus, measurement and payment, additions and alterations or variations and deviations, breach ofcontract, Escalation, settlement of account or final payment, claims, Delay's and Compensation, **Disputes & itsresolution mechanism,** Contract management and administration.

**Valuation:** Definitions of terms used in valuation process, Purpose of valuation, Cost, Estimate, Value and its relationship, Capitalized value. Freehold and lease hold and easement, Sinking fund, depreciation–methods of estimating depreciation, Outgoings, Process and methods of valuation: Rent fixation, valuation for mortgage, valuation of land.

**Course outcomes:** After studying this course, students will be able to:

1. Taking out quantities and work out the cost and preparation of abstract for the estimated cost for variouscivil engineering works.
2. Prepare detailed and abstract estimates for various road works, structural works and water supply andsanitary works.
3. Prepare the specifications and analyze the rates for various items of work.
4. Assess contract and tender documents for various construction works.
5. Prepare valuation reports of buildings..

**AssessmentDetails(bothCIEandSEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall bedeemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE(Continuous InternalEvaluation)andSEE (SemesterEndExamination)taken together.

**CIE(maximummarks50)**

- 50 marks for CIE are split into **30marks** for three Internal Assessment Tests and 2**0marks** for other assessment methods mentioned in 22OB4.2.
- The first test at the end of 30-35% coverage of the syllabus, the second test after covering 65-70%of the syllabus and the third test for 95-100% coverage of syllabus
- The student must secure 40% of 50marks to qualify in the CIE

**SEE (Max 100 Marks scaled downed to 50 Marks)**

Theory SEE will be conducted by University as per the scheduled timetable, with common questionpapersfor thecourse (**duration03hours**)

1. The question paper will have ten questions. Each question is set for 20marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3sub-questions), **should have a mix of topics** under that module.
3. The students must answer 5 full questions, selecting one full question from each module. Marks scored by the student shall be proportionally scaled down to 50Marks

**Suggested Learning Resources:**

**Recommended Reading**:


1. Datta B.N., "Estimating and costing", UBSPD Publishing House, New Delhi.
2. B.S. Patil, "Civil Engineering Contracts and Estimates", Universities Press.
3. M. Chakraborthi; "Estimation, Costing and Specifications", Laxmi Publications.
4. MORTH Specification for Roads and Bridge Works – IRC New Delhi
5. Kohli D.D and Kohli R.C, "Estimating and Costing", 12 th Edition, S.Chand Publishers, 2014.
6. Vazirani V.N and Chandola S.P, "Estimating and costing", Khanna Publishers, 2015.
7. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd., 2015.
8. Duncan Cartlidge , "Quantity Surveyor's Pocket Book", Routledge Publishers, 2012.
9. Martin Brook, "Estimating and Tendering for Construction Work", A Butterworth-Heinemann publishers, 2008.
10. Robert L Peurifoy , Garold D. Oberlender , " Estimating Construction Costs" – 5ed , Tata McGraw-Hill , New Delhi.
11. David Pratt, "Fundamentals of Construction Estimating" – 3ed, Edition.
12. PWD Data Book, CPWD Schedule of Rates (SoR). and NH SoR – Karnataka FIDIC Contract forms.
13. B.S. Ramaswamy "Contracts and their Management" 3ed, Lexis Nexis(a division of Reed Elsevier IndiaPvt Ltd).


**WeblinksandVideoLectures(e-Resources):**

https://youtu.be/ofkpm4lhJcg
https://youtu.be/GGikveOcaJw

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Conduction of technical seminars on recent research activities
- Group Discussion

- Site visits

| Prestressed Concrete | | Semester | 7 |
|---|---|---|---|
| Course Code | BCV703 | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 2:2:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 04 | Exam Hours | 3 |
| Examination type (SEE) | Theory | | |

Course objectives:

- To explain the necessity of prestressed concrete
- To understand the principles and methods of design according to IS 1343 and IRC 112
- To estimate losses due to prestressing
- To design pre-stressed concrete pipes, tanks, beams or I-girder for bridge, one-way and two-way slabs
- To illustrate the concept of special bridge like cable stayed bridges and balanced cantilever bridges

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.
5. Adopt problem-based learning (PBL) to develop analytical and thinking skills.

## Module-1

Introduction to pre-stressed concrete structures: Concepts of Prestressing- Historical development of prestressing-Design Codes for Pre-Stressed Structures- Advantages & Limitations of Pre-stressed Concrete Material - Need for High Strength Concrete- High Tension Steel- Types of Prestressing Steel. Concept of losses of Prestressing.

## Module-2

Analysis of sections for Flexure: Elastic analysis of pre stressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Eccentric and concentric pre stressing, Numerical examples. Load balancing concept and kern point.

## Module-3

Losses of Prestressing and Prestressing Systems: Losses— Immediate losses due to Friction and wobble, Elastic shortening Anchorage Slip - Time dependent losses due to Creep, Shrinkage and Relaxation losses - Introduction to Pre-stressing systems — Pre -Tensioning Devices — Post -Tensioning Devices - Anchorage Devices - Mechanical pre-stressing - Chemical Pre-stressing - Electrical Pre-stressing. Numerical examples on losses.

## Module-4

Deflection of pre stressed concrete beams: Short term and long term deflections, Elastic deflections under transferred loads and due to different cable profiles, Deflection limits as per IS 1343, Effect of creep on deflection, Load versus deflection curve, methods of reducing deflection, Numerical examples.

Limit state of Collapse: Flexure- IS code recommendations, Ultimate flexural strength of sections, IS code recommendations on shear strength, Shear resistance of sections, shear reinforcement, Limit state of serviceability- Control of deflection and cracking, Numerical examples.

| Module-5 |
| --- |
| Design of Beams: Design of pre stressing force and eccentricity for type- 1 post tensioned prismatic beams, permissible stresses, Limiting zone and cable profile. |
| **Assessment Details (both CIE and SEE)**<br>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. |
| **Continuous Internal Evaluation:**<br>• For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.<br>• The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered<br>• Any two assignment methods mentioned in the 220B2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.<br>• For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.<br>Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.<br><br>**Semester-End Examination:**<br>Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).<br>1. The question paper will have ten questions. Each question is set for 20 marks.<br>2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.<br>3. The students have to answer 5 full questions, selecting one full question from each module.<br>4. Marks scored shall be proportionally reduced to 50 marks |

Suggested Learning Resources:

Books

1. Pre stressed concrete, N Krishna Raju, Tata McGraw Hill Publishers, 2009, ISBN 9780070634442
2. Pre stressed Concrete, P Dayarathnam, Oxford and IBH Publishing Co., 2000, ISBN 9780136916352
3. Design of pre stressed concrete structures, T Y Lin and Ned H Burns, John Wiley & Sons, New York, 2008, ISBN 9789812531179
4. Fundamental of pre stressed concrete, N C Sinha and S K Roy, 3rd Edition, S Chand and Company Ltd, 2011, ISBN 9788121924276
5. Code Books: IS 1343:2012; Pre stressed Concrete: Code of practice
6. RC 112 and IS 1343 codes

Web links and Video Lectures (e-Resources):

- E-learning content on L&T Edu Tech Platform.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visit to Site to understand prestressing

**VII Semester**

| INTELLIGENT TRANSPORTATION SYSTEMS | | | |
|---|---|---|---|
| Course Code | BCV714A | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | (3:0:0:0) | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 hours Theory | Total Marks | 100 |
| Credits | 03 | Exam Hours | 03 |
| Examination nature (SEE) | Theory | | |

**Course objectives:**

**This course will enable students**

- To learn the fundamentals of ITS.
- To study the ITS functional areas
- To have an overview of ITS implementation in developing countries

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching/PowerPoint presentations (if needed)
2. Regular review of students by asking questions based on topics covered in the class.

**Module-1 Introduction to Intelligent Transport System**

Introduction to Intelligent Transportation Systems (ITS) -Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security – Safety

**Module-2 ITS Architecture and Hardware**

Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection

**Module-3 Advanced Transport Management System**

Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies- ATMS – Advanced Traveler Information Systems (ATIS)- Route Guidance – Issues - Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components – Algorithm.

**Module-4 Advanced Traveller and Information System**

Travel Information – Pre Trip and Enroute Methods- Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dissemination to Travelers – Evaluation of Information – Value of Information – Business Opportunities

**Module-5 Case Studies**

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

**Course outcome (Course Skill Set)**

On completion of the course the students should be able to

- Understand the sensor and communication technologies.
- Apply the various ITS methodologies
- Define the significance of ITS under Indian conditions

**Assessment Details (both CIE and SEE)**

**CIE for the theory component of the PEC (maximum marks 50)**

**CIE for the practical component of the PEC**

**SEE for PEC**

**Suggested Learning Resources:**

**Books**


1. Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US, 2001.
2. Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill, 1992.
3. Turban E.,"Decision Support and Export Systems Management Support Systems", Maxwell Macmillan, 1998.
4. Sitausu S. Mittra, "Decision Support Systems – Tools and Techniques", John Wiley, New York, 1986.
5. Cycle W.Halsapple and Andrew B.Winston, "Decision Support Systems – Theory and Application", Springer Verlog, New York, 1987
6. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.


**Web links and Video Lectures (e-Resources):**

- https://nptel.ac.in/courses/105107210
- https://www.civil.iitb.ac.in/tvm/nptel/591_ITS_1/web/web.html

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Seminars/Quiz (To assist in GATE Preparations)
- Self-Study on simple topics
- Simple problems solving using Excel
- Discussion of case studies
- Virtual Lab experiments

| Earthquake Resistant structures | | Semester | VII |
|---|---|---|---|
| Course Code | BCV714B | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 hours Theory | Total Marks | 100 |
| Credits | 03 | Exam Hours | |
| Examination nature (SEE) | Theory/practical/Viva-Voce /Term-work/Others | | |

**Course objectives: The Course will enable students**

- Fundamentals of structural dynamics
- Fundamentals of engineering seismology
- Irregularities in building which are detrimental to its earthquake performance
- Different methods of computation seismic lateral forces for framed and masonry structures
- Earthquake resistant design requirements for RCC and Masonry structures and Relevant clauses of IS codes of practice pertinent to earthquake resistant design of structures

**Teaching-Learning Process (General Instructions)**

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Black board teaching/power point presentation
2. Regular review of the students by asking questions based on topics covered in the class

**MODULE-1**

**Introduction to structural dynamics:** Basic Definitions, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles, Types of Vibrations, Damping and its types, Analytical Model of dynamic system, Free vibration of damped and undamped system having single degree of freedom. Concept of equivalent spring, Numerical problems on determining natural period, natural frequency, mass, stiffness, amplitude, and acceleration for undamped free vibration systems.

**MODULE-2**

**Engineering Seismology:** Terminologies (Focus, Focal depth, Epicenter, etc.); Causes of Earthquakes; Theory of plate tectonics; Types and characteristics faults; Classification of Earthquakes; Types and characteristics of seismic waves; Magnitude and intensity of earthquakes; local site effects; Earthquake ground motion characteristics: Amplitude, frequency and duration; Seismic zoning map of India, Earthquake measuring instruments-Seismoscope, Seismograph and accelerograph.

**MODULE-3**

Seismic Performance of Buildings and Over View of IS-1893 (Part-1): Types of damages to building observed during past earthquakes; Plan irregularities; mass irregularity; stiffness irregularity; Concept of soft and weak storey; Torsional irregularity and its consequences; configuration problems; continuous load path; Architectural aspects of earthquake resistant buildings; Lateral load resistant systems. Seismic design philosophy; Structural modeling; Code based seismic design methods.

**MODULE-4**

**Determination of Design Lateral Forces:** Equivalent lateral force procedure and dynamic analysis procedure. Step by step procedures for seismic analysis of RC buildings using Equivalent static lateral force method and response spectrum methods (maximum of 4 storeys and without infill walls). Numerical problems.

**MODULE-5**

**Ductility considerations:** Factor affecting ductility, ductile detailing of flexural members, columns and frame members as per IS13920. Design of Ductile Reinforced Concrete Beams, Seismic Design of Ductile Reinforced Concrete column

**Earthquake Resistant Design of Masonry Buildings:** Performance of Unreinforced, Reinforced, Infill Masonry Walls, Box Action, Lintel and sill Bands, elastic properties of structural masonry, lateral load analysis, Recommendations for Improving performance of Masonry Buildings during earthquakes; Retrofitting of Masonry buildings.

**PRACTICAL COMPONENT OF IPCC***(May cover all / major modules)*

| Sl.NO | Experiments |
|---|---|
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**Course outcomes (Course Skill Set):**

At the end of the course, the student will be able to:

- To formulate the solution for damped and undamped SDOF systems.
- To describe basic principles of engineering seismology
- To describe various irregularities and their limits for earthquake resistant structure as per Indian standard code books.
- Analyze the structure for seismic forces using Equivalent static lateral force method and response spectrum method
- To perform ductile Design of RC members and to describe behavior of masonry under seismic loads.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CIE for the theory component of the IPCC (maximum marks 50)**

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other

assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

**CIE for the practical component of the IPCC**

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

**SEE for IPCC**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

**The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component**.

**Suggested Learning Resources:**

**Books**


1. Pankaj Agarwal and Manish Shrikande, "Earthquake resistant design of structures", PHI India.
2. S.K. Duggal, "Earthquake Resistant Design of Structures", Oxford University Press
3. Anil K. Chopra, "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Pearson
4. Education, Inc.
5. T. K. Datta, "Seismic Analysis of Structures", John Wiley & Sons (Asia) Ltd.
6. David Dowrick, "Earthquake resistant design and risk reduction", John Wiley and Sons Ltd.
7. C. V. R. Murty, Rupen Goswami, A. R. Vijayanarayanan & Vipul V. Mehta, "Some Concepts in Earthquake
8. Behaviour of Buildings", Published by Gujarat State Disaster Management Authority, Government of Gujarat.

**9.** IS-13920 – 2016, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces, BIS, New Delhi.

**10.** IS-1893 – 2016, Indian Standard Criteria for Earthquake Resistant Design of Structures, Part-1, BIS, New Delhi.

**11.** IS- 4326 – 2013, Earthquake Resistant Design and Construction of Buildings, BIS, New Delhi.

**12.** IS-13828 – 1993, Indian Standard Guidelines for Improving Earthquake Resistance of Low Strength Masonry Buildings, BIS, New Delhi.

**13.** IS-3935 – 1993, Repair and Seismic Strengthening of Buildings-Guidelines, BIS, New Delhi.

**Web links and Video Lectures (e-Resources):**

1. https://www.steel-insdag.org/assets/frontend/trmpdf/Chapter41.pdf
2. https://www.steel-insdag.org/assets/frontend/trmpdf/Chapter6.pdf
3. https://www.steel-insdag.org/assets/frontend/trmpdf/Chapter42.pdf
4. https://nptel.ac.in/courses/105105162

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

| Design And Execution of Pile Foundations | | Semester | 7 |
|---|---|---|---|
| Course Code | BCV714C | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 3 |
| Examination type (SEE) | Theory | | |

**Course objectives:**

- Introduce the concept of Piling works and design requirements for a pile
- Elaborate the construction procedures which are involved in different pile foundations
- Explain the different load test which need to be conducted on the piles.
- Understand the Environmental, Health and Safety standards which need to be in place for the handling of the pile works
- Elaborate on the bill of quantities of various Pile foundations

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.
5. Adopt problem-based learning (PBL) to develop analytical and thinking skills.

**Module-1**

**Introduction to piles, Design and construction of Bored Cast insitu piles and Driven Cast insitu piles:** Overview of Pile foundations, Selection Criteria, Common Design considerations, General Terminologies and Indian standard codes. Materials and Equipment, Construction procedures, workmanship, Vertical and Lateral Capacity calculations, Load tests, Case Studies of Bored cast insitu piles and Driven cast insitu piles

**Module-2**

**Introduction, design and construction of precast driven and under reamed piles:** Materials and Equipment, Construction procedures, workmanship, Vertical and Lateral Capacity calculations, Load tests, Case Studies of precast driven piles, precast driven piles in pre-bored holes and Under reamed piles

**Module-3**

**Grouping and settlement of piles and testing:** Introduction to Grouping and Settlement of piles, Pile Group efficiency and Spacing, Capacity of Pile group, Settlement of Pile group, Case studies Introduction & Types of testing on piles and General requirements for testing, Pile Integrity tests - introduction & Equipment Types of Pile Integrity test, Data Recording & Interpretation of results, Introduction to quality assurance of piles, General requirement

**Module-4**

**Quality control and Special Types of piles:** Quality Control of BCIS, DCIS piles, Quality records and checklists. Materials, Equipment, manufacturing procedure, Design and installation, suitability and application and failure modes of spun piles and helical piles

**Module-5**

**Software and Bill of quantities, Construction challenges:** Introduction to Bill of quantities for Bored cast insitu, Driven Cast insitu, Precast driven and Precast driven piles in pre-bored holes and undreamed piles. Challenges in bored and driven piles, Introduction to types of piling

software, Software demonstrations (e.g., PLAXIS) and step-by-step design techniques for deep foundations. Modelling in Plaxis 2D

**Course outcome (Course Skill Set)**

At the end of the course, the student will be able to :

1. Comprehend Basic design concepts, of pile foundations
2. Compute capacity of piles and select suitable type of pile foundation based on soil conditions
3. Apply different construction procedures of pile foundation
4. Design and execute different load testing on piles
5. Compute bill of quantities for pile foundations

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Books**

1. IS 2911- Indian standard code driven cast insitu, bored cast insitu, Driven precast piles
2. IS 14593-Indian standard code for bored cast insitu piles founded on rocks – Guidelines
3. Michel Tomilson and John Woodward, "Pile design and construction practice", CRC Press

**Web links and Video Lectures (e-Resources):**

- E-learning content on L&T EduTech Platform.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Visit to a nearby site if available to pile foundation

**VIISemester**

| BUILDING SERVICES-HVAC,ACOUSTICS AND FIRE SAFETY | | | |
|---|---|---|---|
| CourseCode | BCV714D | CIEMarks | 50 |
| TeachingHours/Week(L:T:P:S) | 3+0+0 | SEEMarks | 50 |
| TotalHoursofPedagogy | 40 | TotalMarks | 100 |
| Credits | 3 | ExamHours | 3 |

**CourseLearningObjectives:**Thiscoursewillenablestudentsto;

1. TolearnthebasicsofMEPsystems.(Mechanical,Electricalandplumbing)
2. Toexposethelearnerstobuildingacoustics
3. ToimpartknowledgeonHVACandfireprotectionsystemsinbuilding

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Chalk and talk, PPT presentations,
2. You tube videos,
3. visit to nearby sites
4. NDT EQUIPMENTS AWARENESS

**Module-1**

**AdvancedElectricalSystemDesignforBuildings** :Basics of Electrical System, Electrical terminologies, Major Electrical equipment, Buildingpower distribution and its schemes, Fundamentals of Power& distribution transformers, HT,LT, DG Sets, Cables & Wires, UPS and its importance, Introduction of HT, LT switchgearssystems,ImportanceofLightingdesign&differentLightfixturesusedinbuildings–Interior,external, street & offices,RMU, HT consumer, Substation Building in Master plan - SpaceplanningforRMU,HT,DGset,HSDyard,SpaceprovisionforElectricalEquipmentincludingSubstation,Variousequipmentclearancerequirements,HVAC,PHE,FPSservice-electricalloadinputfordesigningelectricalpowerdistribution,Pedestals&ceilingsupportrequirementforallElectricalequipment.

| **Teaching-LearningProcess** | Chalk&Talk,PPTpresentation,Youtubevideos,Nearbysitevisits |
|---|---|

**Module-2**

**ExtraLowVoltageSystemforInfrastructureandBuildingAcoustics:**Introduction & Brief of ELV Systems, Concept of Building Management System (BMS) &Fire Alarm System, Interface with Architecture/ Structure, Access control, CCTV & Publicaddresssystem-Briefandpurpose,BMS-Briefandpurpose,BMSinterfaceswithElectrical,HVAC,Fire&LifeSafetyandPHE,BMSinterfaceswithairportsystems.BasicsofsoundandBuildingacoustics–Acousticdefectsandpreventionofsoundtransmission

| **Teaching-LearningProcess** | Chalk&Talk,PPTpresentation,Youtubevideos,Nearbysitevisits |
|---|---|

**Module-3**

**Heating,Ventilation&Airconditioningsystems** :Basics of HVAC - Psychrometry and its importance - Major Components of Air conditioningSystem-FundamentalconceptsofHeattransfer,Air-conditioningsystem,Ventilationsystem, Pressurization Systems and their importance to Life safety, Chilled water system,Cooling towers and major HVAC equipment, Pumping system in HVAC, Importance ofThermalandAcousticInsulation,IntroductionandbasicsofVariableRefrigerantFlow(VRF)systems,Radiantcooling,Underfloordistribution,Chilledbeams–Spaceplanning-ImportanceofStaticweight/Operatingweightsofmechanicalequipment-Importanceof FloorslabandTerraceroofslabopenings/cut-outs

| **Teaching-LearningProcess** | Chalk&Talk,PPTpresentation,Youtubevideos,Nearbysitevisits |
|---|---|

**Module-4**

**FireProtectionandLifeSafetySystem** :Basics of Fire Protection System - Active Fire protection system - Passive Fire protectionsystem-BasicsofSmokeControlandFireStopSystems-Codes&StandardsandStatutoryCompliance - Fire and its Classes - Hazard Classification based on building occupancy -Means of Egress and its components - Importance of Life Safety - Refuge Area, Fire TowerandFireLift-OccupantLoadandCapacityfactors-FireStoppingMaterials-Compartmentationinabuilding-Smokecontrol&managementinFireZoning–ComponentsofFireCompartments.

| | |
|---|---|
| **Teaching-LearningProcess** | Chalk&Talk,PPTpresentation,Youtubevideos,Nearbysitevisits |

**Plumbingforwatersupplyandsanitarysystem** :ScopeofworksinPublicHealthEngineering-Sanitaryfixturesandtypes-Watersupplyandtreatment - Rain water drainage system - Landscape irrigation features – Water demandcalculationbasedonbuildingoccupancy–Pipingfordifferentplumbingsystemsinbuildings–Pumpselection–Plantroomsizing-Sewagetreatmentprocess-Externalwatersupply,storm drainage & sewerage system - Solid waste management - Interfacing PHE system withArchitectandStructuralengineers.

| | |
|---|---|
| **Teaching-LearningProcess** | Chalk&Talk,PPTpresentation,Youtubevideos,Nearbysitevisits |

**Courseoutcome(CourseSkillSet)**

Attheendofthecoursethestudentwillbeableto:

1. **Understand**ElectricalSystemalongwithsubstationforabuildinginfrastructure
2. **Comprehend**thebasicsofacousticsandELVsystemsinbuilding.
3. **Design**andimplementationofHVACSystem
4. **Implement**FireAlarmSystem(PAS)forbuilding
5. **Understand**theimportanceofwatersupplyandsanitaryplumbingsystemforabuilding

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

**SuggestedLearningResources:**

**TextBooks**

1. CodeofPracticeforfiresafetyofbuildings(IS1641–IS1646)
2.

**Module-5**

**ReferenceBooks:**

1.
2.

**WeblinksandVideoLectures(e-Resources):**

- . Online study material
- NPTEL video lectures.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visit to Actual Repair, Retrofitting and Rehabilitation of Structures sites.
- Imparting knowledge of Techniques and materials for retrofitting.
- Mini Projects to explain the concept of Repair, Retrofit and Rehabilitation of structures.

| ROAD SAFETY ENGINEERING | | Semester | 7 |
|---|---|---|---|
| Course Code | **BCV755A** | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P: S) | 2:2:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 3 |
| Examination type (SEE) | Theory | | |

**Course objectives:**

- To provide students with a comprehensive understanding of the principles, strategies, and techniques related to ensuring safety on roadways.
- To equip students with the knowledge and skills necessary to analyse road safety issues
- To design effective road safety measures, and contribute to the improvement of road safety practices.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.

**Module-1**

**Accident Investigations And Risk Management:** Collection Of Accident Data, Assessment Of Road Safety, Methods To Identify And Prioritize Hazardous Locations And Elements, Determine Possible Causes Of Crashes, Crash Reduction Capabilities And Countermeasures, Effectiveness Of Safety Design Features, Accident Reconstruction, Condition And Collision Diagram.

**Module-2**

**Traffic Engineering Studies:** Statistical Methods In Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons- Traffic Management Measures And Their Influence On Accident Prevention.

**Module-3**

**Road Safety In Transport Planning And Geometric Design:** Vehicle And Human Characteristics, Road Design And Safety Elements, Redesigning Junctions, Cross Section Improvements, Traffic Control, Traffic Calming Measures, Road Safety Furniture

**Module-4**

**Role Of Signs And Markings In Safety:** Types Of Signs – Design Specifications – Guidelines For Installation – Role Of Signs In Safety; Types Of Road Markings – Design Specifications – Role Of Road Markings In Safety.

**Module-5**

**Traffic Management Systems For Safety:** Road Safety Audits And Tools For Safety Management Systems, Road Safety Audit Process, Road Safety Improvement Strategies, ITS And Safety.

**Course outcome (Course Skill Set)**

At the end of the course, the student will be able to :

1. Analyse road safety data, identify hazardous locations, and assess safety risks on roadways.
2. Evaluate the effectiveness of road safety interventions and conduct post-implementation analysis.
3. Utilize modelling and simulation techniques to predict and assess the impact of road safety measures.
4. Demonstrate knowledge of traffic control devices, traffic management strategies, and their role

in enhancing road safety.

5. Comprehend the legal and policy framework related to road safety engineering and contribute to policy development.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Books**

1. Traffic Engineering And Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals Of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C.Jotin Khisty, B. Kent Lall
4. Fundamentals Of Traffic Engineering, Richardo G Sigua
5. Handbook Of Road Safety Measures, Second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson
6. Road Safety By NCHRP

**Web links and Video Lectures (e-Resources):**

- NPTEL and YouTube Videos.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Visit to Traffic Police station and traffic monitoring station

| CONSERVATION OF NATURAL RESOURCES | | Semester | 7 |
|---|---|---|---|
| Course Code | BCV755B | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 3 |
| Examination type (SEE) | Theory | | |

**Course objectives:**

- Learn types of land forms, soil conservation and sustainable land use planning.
- Apprehend water resources, types, distribution, planning and conservation. Water pollution and types of uses.
- Know the types of minerals and rocks.
- Know the atmospheric composition of air, pollution and effects on human beings, animals and plants. Air pollution control.
- Apprehend basics of biodiversity and ecosystems.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Power point Presentation
2. Video tube, NPTEL materials
3. Quiz/Assignments/Open book test to develop skills
4. Adopt problem based learning (PBL) to develop analytical and thinking skills
5. Encourage collaborative learning, site visits related to subject and impart practical knowledge.

**Module-1**

Land: Land as a resource, types of lands, conservation of land forms, deforestation, effect of land use changes. Soil health, ecological and economic importance of soil, impact of soil degradation on agriculture and food security, need for soil conservation, sustainable land use planning.

**Module-2**

Water: Global water resources, Indian water resources, Resources system planning. Water use sectors- domestic, industrial, agriculture. Water deficit and water surplus basins in India, equitable distribution, Inter-basin water transfers, Interlinking of rivers – Himalayan component, peninsular component, issues involved. Ground water, its potential in India, conjunctive use, recharge of ground water. Contamination of ground water, sea water ingress, problems and solutions.

**Module-3**

Air: Introduction, composition, sources and classification of air pollutants, National Ambient Air quality standards (NAAQS), Air quality index, effects of air pollution on human health. Economic effects of air pollution. Control of air pollution by equipment, smoke and its control. Ozone depletion –impacts, photochemical changes.

**Module-4**

Biodiversity: Introduction, Flora and Fauna, Importance of biodiversity, Economic values-medicinal plants, drugs, fisheries biogeochemical cycling. Threat to biodiversity, natural & anthropogenic disturbance, habitat loss. Conservation of biodiversity, National parks, wild life sanctuaries, zoological gardens, gene banks, pollen culture, ecological restoration, social forestry. Ecosystem: Definition, Types: forest, grass land, marine, desert, wetlands, estuarine, lotic, lentic. Abiotic & biotic components of ecosystem.

**Module-5**

Global warming: concept, indicators, factor and effects. Global climate change-indicators, health impacts, effect on biodiversity. Introduction to global efforts in conservation of biodiversity. .EIA regulations in India, status of EIA in India, list of projects needing environmental clearance under EIA notifications. Case study of hydro power/ thermal power projects

**Course outcome (Course Skill Set)**

At the end of the course, the student will be able to :

1. Apprehend various components of land as a natural resource and land use planning.
2. Know availability and demand for water resources as applied to India.
3. Analyse the components of air as resource and its pollution.
4. Discuss biodiversity & its role in ecosystem functioning.
5. Critically appreciate the environmental concerns of today.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

1. P.Jaya Rami Reddy, "A Textbook of Hydrology", University Science Press, New Delhi, 2011.
2. Krishnamurthy K.V., "An advanced textbook of Biodiversity- principle & practices." Oxford and IBH publications Co.Pvt ltd, New Delhi. 2004.
3. Odum, E.P., "Fundamentals of Ecology", W.B sounders, Philadelphia, USA, 1971
4. Singh J.S, Singh S.P & Gupta, S.R., "Ecology, environment and resource conservation", Anamaya publications, 2006

**Web links and Video Lectures (e-Resources):**

- NPTEL video lectures and YouTube videos.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Visit to forest department, KSNDMC, KSRSAC to understand Natural resources data and Management

**VII Semester**

# ENERGY EFFICIENCY, ACOUSTICS AND DAYLIGHTING IN BUILDING

| | | | |
|---|---|---|---|
| Course Code | **BCV755C** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3+0+0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 3 | Exam Hours | 3 |

**Course Learning Objectives:** This course will enable students to;

1. To facilitate learners to understand climatology, heat ingress in building and energy
2. To expose the learners to building acoustics, indoor air quality and day lighting.
3. To impart fundamental knowledge on Life cycle assessment and Energy efficiency in buildings.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Chalk and talk, PPT presentations,
2. You tube videos,
3. visit to nearby sites
4. NDT EQUIPMENTS AWARENESS

**Module-1**

**Introduction to Climatology and heat ingress in building:** Basics of climatology, Earth – Sun relationship, Solar angles and sun path diagram, Design of shading systems. Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies.

| | |
|---|---|
| **Teaching-LearningProcess** | Chalk & Talk, PPT presentation, Youtube videos, Nearby site visits |

**Module-2**

**Building acoustics, Indoor air quality and Lighting in buildings:** Basics of sound and Building acoustics – Acoustic defects, prevention of sound transmission and acoustic measure for office building. Indoor Air Quality – Effects, control of contaminants and moisture in indoor environment, Integrated approach for IAQ management. Fundamentals of lighting- Day lighting and its metrics – Strategies for day lighting and its control. Artificial lighting – Design and control strategies – Visual comfort enhancement.

| | |
|---|---|
| **Teaching-Learning Process** | Chalk & Talk, PPT presentation, Youtube videos, Nearby site visits |

**Module-3**

**Energy efficient buildings, Water and Waste management in buildings** :Energy efficiency – Energy efficiency in building envelope and energy efficient HVAC and Lighting as per Energy conservation building code (ECBC) 2017, Energy simulation, Energy management system – Renewable energy and Energy Audit. (demand control ventilation) Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse and Water efficient landscape system.

Waste management – Types of waste and its treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, healthcare facilities.

| | |
|---|---|
| **Teaching-Learning Process** | Chalk & Talk, PPT presentation, Youtube videos, Nearby site visits |

**Module-4**

**Life Cycle Assessment of Buildings and Green project management:** Materials – Green product certifications, features of sustainable building materials and sustainable alternatives for structural, envelope and finishing materials. Low carbon cement, Zero emission bricks and lean construction practices.

Life cycle assessment and its types – Modelling and Analysis, Greenhouse gas emission.

Different phases of Green building project management.

| | |
|---|---|
| **Teaching-Learning Process** | Chalk & Talk, PPT presentation, Youtube videos, Nearby site visits |

**Module-5**

**Energy Efficient rating** :Energy efficiency rating for distribution transformers, diesel generator set, motors, pumps, electrical appliances, lighting fixtures and lifts as per Bureau of Energy Efficiency (BEE). Energy efficiency in HVAC system – Variable Frequency Drive (VFD), Air volume drive. Roof top solar installations and solar water heaters, Heat recovery system in buildings, Building Management System (BMS) – Occupancy sensors and energy efficient lighting controls,Smart Buildings.

| **Teaching-Learning Process** | Chalk & Talk, PPT presentation, Youtube videos, Nearby site visits |
|---|---|

**Course outcome (Course Skill Set)**

At the end of the course the student will be able to :

1. **Comprehend** climatology, shading system and analyze heattransfer mechanism in buildings.
2. **Assess** the design considerations and parameters for lighting, acoustics and indoor air quality.
3. **Develop** solutions for energy efficiency, water efficiency and waste management in buildings.
4. **Calculate** energy savings and CO2 mitigation using web tools such as **ECONIWAS** and **Solar rooftop calculator**.
5. **Adopt** green project management methodology and evaluate building life cycle assessment.
6. **Understand** energy efficiency measures in a building.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Text Books**

1. **HarharaIyer G, Green Building Fundamentals, Notion Press**
2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices

**Reference Books:**

1. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019
2. National Building Code – 2016, Volume 1&2, Bureau of Indian Standards
3. Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureauof Energy Efficiency.

**Web links and Video Lectures (e-Resources):**

- . Online study material
- NPTEL video lectures.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

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| Precast Members – Systems & Construction | | Semester | 7 |
|---|---|---|---|
| Course Code | **BCV755D** | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 3 |
| Examination type (SEE) | Theory | | |

**Course objectives:**

- Impart concepts of precast concrete building design
- Comprehend various aspects like selection and planning of structural system and its components, significance, plant and production methods, transportation and erection sequence of precast elements
- Evaluate actual loads, integrating architectural and services requirements, structural modelling & analysis of a precast building
- Design and detailing of precast multi-storeyed building using software.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.
5. Adopt problem-based learning (PBL) to develop analytical and thinking skills.

**Module-1**

**Introduction to Precast and its elements:** tractors, end users) and Limitations, Residential, Commercial & Industrial Applications of precast, Materials used, Code provisions and clauses. **Major elements** (Beam, slab, wall, column, foundation, staircase, roof elements, façade) : Classification, Types and shapes, selection, application, erection, advantages, Infra works - Pipes & drains, duct bank, baggage handling tunnel, culvert and sleeper, facia element, pavement and channel.

**Module-2**

**Precast Structural Systems, Production, Storage, & Logistics:** Structural System: Skeletal System, Portal Frame system, Large Panel system, Cell Block system and hollow block system, Guide lines of selection – Residential & office buildings, Industrial Buildings, Commercial buildings, Structural Stability and Structural Behaviour.

**Plant and Production:** Introduction -Types & Process, Production – Design and shop drawings, check lists, Moulding, Casting and its types, Concreting, Curing, Demoulding and inspection.

**Storage, Delivery, Handling**- introduction and types of equipment, lifting devices, Erection and installation - Horizontal components, vertical components, special elements, Quality Inspection and Tolerance

**Module-3**

**Modelling, Analysis and design of Wall system:** Design Basis Criteria: Geometric parameters and Occupancy, Location and Associated Parameters, Systems and material specifications, analysis tools, Loads and Load Combinations – gravity loads, lateral loads ( seismic and wind)

**ETABS software**, Modelling, Analysis and Design of structural elements for RC Wall system: Design of RC wall, beam, slab & staircase, Design for stripping, stacking, transportation and

erection for all elements

**Module-4**

**Joints Connections for RC Wall system, Modelling, Analysis, Design of the Frame system:** Joints connections for RC wall system – Wall to foundation, wall to wall horizontal connection, wall to wall vertical connection, beam to wall connection, beam to beam connection, slab to wall – progressive collapse, diaphragm action & slab to beam connection, staircase to beam or wall connection.

Modelling, Analysis and design for Frame system and its connections: ETABS Modelling, Analysis and Design for frame system (foundation, column, beam, slab etc.)

**Module-5**

**Prestressed concrete and Preventive Measures and case studies:** Prestressed Concrete, Various types of slab design and its check, Slab to beam connection Preventive Measures – Testing requirements, water tightness, temporary supports, MEP related preventive measures, progressive collapse – introduction and design, common defects and remedies.

Case Studies - Residential Project, Commercial Project

**Course outcome (Course Skill Set)**

At the end of the course, the student will be able to :

1. Comprehend the necessity of precast construction
2. Adopt the appropriate mould and method for casting, transportation, and erection.
3. Compute loads (Dead, Superimposed, Live, Wind, Seismic) of various elements & services and select appropriate vertical & lateral load resisting systems for the various loads acting on the building
4. Create and analyze a precast building model using ETABS software
5. Design of precast building including connections, adhering to the code requirements & functional aspects

## Assessment Details (both CIE and SEE)

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3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Books**

1. IS 15916, Building Design and Erection Using Prefabricated Concrete
2. IS 13920, Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces
3. Precast Concrete Structures Paperback – 12 June 2019 by Kim S. Elliott
4. Precast Concrete Structures – 2018 by Hubert Bachmann and Alfred Steinle Specifications

**Web links and Video Lectures (e-Resources):**

- E-learning content on L&T EduTech Platform.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Site visit to understand Precast construction