

Specialisation Courses

Course Description

Title: Sustainable Construction
L-T-P scheme: 3-0-0

Code: 18B11CE911
Credits: 3

Prerequisite: Building Materials and Construction

Objective:

The objective of this course is to introduce the fundamentals of sustainable construction and relate it to field problems.

Learning Outcomes:

Sustainable Construction	
CO1	Outline the concepts of Sustainable Construction.
CO2	Identify the Process Design and Development- Sustainability .
CO3	Analyze the Socio-economic feasibility of sustainable construction for a given problem.
CO4	Describe the Life Cycle Assessment and Costing.
CO5	Determine the feasibility of chemicals/admixtures for a given real time problem.
CO6	Apply the concepts of advanced sustainable materials in practical situations..

Course Content:

Unit 1: Fundamentals of Sustainable Construction Engineering- Sustainability and resources, need, present practices at national and international level,

Unit 2: The Sustainability Quadrant- challenges & Issues, Government initiatives. Construction Product, Process Design and Development- Sustainability of construction resources, process modifications, product performance evaluation.

Unit 3: Sustainability assessment using standard approaches- LEED/GRIHA rating evaluation process. Socio-economic feasibility of sustainable construction products- Innovative & customized sustainable product design based on social constraints, tools & aids available for sustainable construction products.

Unit 4: Life Cycle Assessment and Costing-Variou aspects related to construction cost, present value analysis, life cycle stages, cost calculation & measures, evaluation criteria, uncertainty assessment, sensitivity analysis, break even analysis.

Unit 5: Various construction chemicals/admixtures , Fly ash and its use in concrete ,Silica fume concrete ,Self compacting concrete, Fiber Reinforced plastics and concrete ,Light weight concrete.

Unit 6: Crumb modified bitumen Rubber, Glenium Concrete Materials used in nuclear-containment structures. High performance concrete, Nano technology in cement concrete, Ferrocement Technology

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Construction equipments (will be added from time to time):
Digital copy will be available on the JUET server.

Textbooks:

1. Sustainable Engineering Practice ASCE Publication 2010.
2. Hagger Sustainable Industrial Design and Waste Management, Techniz Book 2010.

Reference Books:

1. Concrete Technology by M.S.Shetty, S.Chand Publ.
2. Building Materials by M L Gambhir, Neha Jamwal, Tata McGraw Hill Publ.
3. Helmut Rechberger, Practical handbook of Material Flow Analysis, Taylor & Francis. 2010.
4. Michael Z. Hou, Heping Xie, Jeoungseok Yoon Underground Storage of CO₂ and Energy Taylor & Francis, 2010.

Course Description

Title: Construction Planning and Control
L-T-P scheme: 3-0-0

Code: 18B11CE912
Credits: 3

Prerequisite: Nil

Objective:

To learn how to use the knowledge of planning and control in understanding the behavior of construction project management. This course serves as an introduction to Construction Planning and Control applied for Civil Engineering project management..

Learning Outcomes:

Learning Outcomes:

Course Outcome	Description
CO1	Outline the construction planning & control in scheduling
CO2	Identify planning and control in building plan, elements of network
CO3	Analyze preconstruction, construction, and procurement activities.
CO4	Describe Bar Charts and Critical Path Method Networks
CO5	Determine resource requirements of a project
CO6	Apply Earned Value Analysis and other progress metrics for cost control.

Course Content:

Unit 1 - Construction Planning & Control Conversion of a Scope of Work into scheduling activities.

Unit 2 - Developing a building plan including preconstruction, construction, and procurement activities.

Unit 3 -Preparing, analyzing, and updating Bar Charts and Critical Path Method Networks; prepare and presenting schedule information.

Unit 4 - Assigning and analyzing resource requirements of a project; performing time/cost trade-off analyses.

Unit 5 - Justifying claims for additional time; processing schedule information in a computerized scheduling package

Unit 6 - Controlling cost by applying the Earned Value Analysis and other progress metrics.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.

- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 & Unit-2
Test-2	25 Marks	Based on Unit-3 and Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Construction Planning & Control (will be added from time to time): Digital copy will be available on the JUET server.

Text books:

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.
3. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.
4. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.
5. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.

Course Description

Title: Construction Safety and Health
L-T-P scheme: 3-0-0

Code: 18B11CE913
Credit: 3

Prerequisites: None

Objective:

The objective of this course is that students will learn about minimum safety and health requirements related to construction activities.

Learning Outcomes:

CO1	Outline the concepts of safety, factors affecting safety
CO2	Identify and plan for safety provisions and techniques for construction safety management,
CO3	Analyse the need for demolition and management of accidents and injuries.
CO4	Describe the roles of organizations and personnel involved in major construction projects and explain how each affects site safety.
CO5	Demonstrate construction safety in an increasingly challenging and changing environment
CO6	Explain the legal aspects including liability and regulatory requirements of construction safety.

COURSE OUTLINE:

Unit-1: Concept of safety, factors affecting safety: psychological and technological,

Unit-2: Planning for safety provisions, techniques for construction safety management, safety considerations during construction,

Unit-3: Demolition and use of equipment; management of accidents/injuries, site management with regard to safety recommendations, training for safety awareness, implementation of health & safety plans, construction hazards & solutions, formulation of safety manuals, safety legislation, standards/codes with regard to construction safety, case studies,

Unit-4: Construction safety management – fundamentals, measuring performance & recording information, health hazard in construction, personal protective and lifesaving equipment, the safety policy; assessing the risks, control strategies for construction work; fire safety, the health and safety plan,

Unit-5: Training; meetings, understanding people, access to information, environment, health and safety issues - construction and the environment, construction health and safety law

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2, Unit-3, and Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5, around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on the Theory of structures (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Safety, Occupational Health and Environmental Management in Construction by S C Sharma & Vineet Kumar

TEXT BOOKS / REFERENCES:

Hill, Darryl C. (2004) Construction Safety Management and Engineering. American Society of Safety Engineers, Des Plaines, Illinois.

Course Description

Title: Advances in Construction materials
L-T-P scheme: 3-0-0

Code: 18B11CE914
Credit: 3

Prerequisite: Building materials and construction

Objective:

To introduce the advanced building materials used in the construction industry or being studied at the research level.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the various properties and uses of construction materials.
CO2	Describe the behavior of materials.
CO3	Develop the concepts of construction materials for appropriate field applications as per IS code requirements.
CO4	Identify the requirements of construction materials as per IS codes.
CO5	Demonstrate the structural aspects of different materials and the technicalities involved in construction methods.
CO6	Apply the concepts developed for the planning and construction of buildings.

Course Content:

Unit-1: Foams and lightweight materials, fiber reinforced concrete. Types of fibers, workability, mechanical and physical properties of fiber reinforced concrete,

Unit-2: Industrial waste materials in concrete, their influence on physical and mechanical properties and durability of concrete.

Unit-3: Concrete at high temperature, High strength concrete, changes in concrete with time, corrosion of concrete in various environments, corrosion of reinforcing steel, electrochemical process, measures of protection, Ferro-cement Architectural use, and aesthetics of composites.

Unit-4: materials and properties polymers Civil Engineering Polymers, fibers and composites, fiber-reinforced plastic in sandwich panicles, modeling.

Unit-5: Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers,

Unit-6: polymer foams and polymers in building physics, Polymer concrete composites.

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slide on Recent advances in Construction materials (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Interscience Publication by Broutman. A Wiley John Wiley & sons New York, 1996.
- 2 Engineering Materials by Rangwala S C Charotar Publishing house , Anand, 1985.
3. Weather Head R G “FRP Technology” Applied Science Publishers Ltd , London ,1998.
4. Civil Engineering Materials by Raina K B Tata McGraw- Hill Publishing Company Ltd, New Delhi, 1999.
5. Engineering Materials .by Budinski KG, Prentice Hall of India, New Delhi, 1985.

Reference Books/Material:

1. Concrete, Prentice-Hall, by P. K. Mehta, P J M Monteiro, New Jersey
- 2 Handbook of Concrete Mixes, Special Publications No 24 BIS New Delhi
3. EFNAARC Guidelines on SCC
4. ACI Special Publications
5. IS Specifications

Course Description

Title: Value Engineering
L-T-P scheme: 3-0-0

Code: 18B11CE915
Credits: 3

Prerequisite: None

Objective: This course is designed to explain the value concept of methods, objects and planning.

Learning Outcomes:

Course Outcome	Description
CO1	Outline general techniques of Value Engineering in a business organization.
CO2	Identify special techniques in Value Engineering.
CO3	Analyze analytical and decision-making skills in the Value Engineering job.
CO4	Describe structured phases of Value Engineering and build teams.
CO5	Determine strategy for formulating Value Engineering Study Team, Value Engineering Study Procedure and the workshop approach to achieving value.
CO6	Apply Target setting, Time management, Assessment of Value Engineering Results and case study discussions.

Course Content:

Unit 1 - Concepts: Introduction, History of value engineering, Value, Function, Cost, Worth, Case Study Discussions.

Unit 2 - General Techniques in Value Engineering: The Gordon Technique, Feasibility Ranking, The Morphological Analysis Technique, ABC Analysis, Probabilistic Approach, Case Study Discussions.

Unit 3 - Special Techniques in Value Engineering: Function – Cost – Worth Analysis, Function Analysis

Unit 4 - System Technique - Technically oriented FAST and Customer-oriented FAST, Weighted Evaluation Method, Quantitative Method, Evaluation Matrix, Life Cycle Cost (LCC), Case Study Discussions.

Unit 5 - Applications of Value Engineering: Guidelines for formulating Value Engineering Study Team, Value Engineering Study Procedure, the workshop approach to achieving value.

Unit 6 - Target setting, Time management, Assessment of Value Engineering Results, Case Study Discussions.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 & Unit-2
Test-2	25 Marks	Based on Unit-3 and Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Value Engineering (will be added from time to time): Digital copy will be available on the JUET server.

Text books:

1. Anil Kumar Mukhopadhyaya, Value Engineering Concepts, Techniques and Applications, Response Books, 2013.
2. Anil Kumar Mukhopadhyaya, Value Engineering Mastermind from Concept to Value Engineering Certification, Response Books, 2009.
3. Lawrence D. Miles, Techniques of Value Analysis and Engineering, McGraw-Hill Book Company, 2009.
4. M.R.S. Murthy, Cost Analysis for Management Decisions, Tata McGraw-Hill Publishing Company Ltd., 1988.
5. IS 1180: 2003 Indian Standard “Guidelines to establish a Value Engineering Activity” (First Revision)

Course Description

Title: Construction Financial Management
L-T-P scheme: 3-0-0

Code: 18B11CE916
Credits: 3

Prerequisite:

Objective:

The Construction Financial Management course teaches an all-important skill when it comes to construction and development. In this course, you'll learn how to control costs and monitor project cash flow.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various types of construction, estimating, pricing and management.
CO2	Identify building estimates and cost control methods.
CO3	Analyze project cash flow and tenders in cost estimating.
CO4	Describe the real estate finance and mathematics of money.
CO5	Determine the financial plans for real estate projects.
CO6	Apply risk in project and construction finance.

Course Content:

Unit-1: understanding design in the construction industry, Overview of the types of cost estimates, Understanding structural steel and estimating equipment costs, Understanding cost indices, learning about concrete and reinforcing steel.

Unit-2: Estimate classification, methods and formats, Building and finalizing the estimate, Checks and due diligence, Bids and procurement, Cost reporting, Change orders and communication, Methods of cost control, Defining EVM, Closing out a project, Cost estimation, The role and responsibilities of a cost managers.

Unit-3: Cash flow methods, Charting cash flow, Calculating billing, The payment cycle, Accelerating revenue, Program cost control, Defining the cost of a capital program, Estimating software in action, Workflows. Computing interest calculations, The present and future value of money.

Unit-4: Introduction to financing development projects, Development costs, Introduction to financial plans for development projects, Debt financing of real estate projects, Net comprehensive cash flows for sponsor and lender, DCF project evaluation for sponsor and lender.

Unit-5: Introduction to decision tree analysis, Global project finance overview, Stakeholders in project finance, Principles of project financing, Risk and risk allocation, Contracts and agreements, Money and estimate in capital project delivery, Benchmarking and normalization process, Mitigating risk through lean project delivery systems.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on & Unit-2, & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Applied Mechanics (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Construction Accounting & Financial Management: Pearson New International Edition by Stephen Peterson.
2. Financial Management and Accounting Fundamentals for Construction Book by Bolivar A. Senior and Daniel W Halpin, 2 September 2009.
3. Cost Accounting and Financial Management for Construction Project Managers Textbook by Len Holm, 2 August 2018.
4. Financial Management in Construction Contracting Book by Andrew Ross and Peter Williams, 30 November 2012.

Reference Books:

1. Risk and Financial Management in Construction Book by Simon Burtonshaw-Gunn, (2009).
2. Accounting and Financial Management for Residential Book by Emma S. Shinn, (2002).
3. The Handbook of Construction Accounting and Financial Management, Book by William E. Coombs and William J. Palmer, (1984).

Course Description

Title: Project Oriented Practice

L-T-P scheme: 0-0-4

Code: 18B17CE971

Credits: 2

Prerequisite: Students must have already studied the basic CE courses and have explored the various dimensions of it.

Objective:

1. Students will be able to identify/formulate project problem.
2. Students will be able to write a review paper in the format of standard journal/transactions related to a particular topic.
3. Students will be able to present his work as per standard way of presentation.

Learning Outcomes:

Course Outcome	Description
CO1	Interpret data from research papers
CO2	Analyze seminar and presentations
CO3	Development of the theoretical model analysis of the planned work.
CO4	Develop writing skill for competence- technical report, design aspects, social issues, etc.
CO5	Conduct conversation practice: face to face and via media.
CO6	Write report on the basis of study carried out

Course Content

UNIT-1 Literature survey and review, the process of research, Formulation of a research problem, Experimental design –Classification. Theoretical research, Formulating a problem, verification methods, modelling and simulations, ethical aspects, IPR issues, Copyrights and Patenting etc.

UNIT-2 student is required doing an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study.

UNIT-3 Research Problem identification, Probable solutions, verification of the proposed methodology, conclusions. Meaning, Need and Types of research design, Research Design Process, Measurement and scaling techniques, Data Collection – concept, types and methods, Processing and analysis of data, Design of Experiment

UNIT-4 Quantitative Techniques Sampling fundamentals, Testing of hypothesis using various tests like Multivariate analysis, Use of standard statistical software, Data processing, Preliminary data analysis and interpretation.

UNIT-5 Research Communication, Writing a conference paper, Journal Paper, Technical report, Dissertation/thesis writing. Presentation techniques, Patents and other IPRs, software used for report writing such as WORD, Latex etc

Teaching Methodology: Dissertation is a course requirement wherein under the guidance of a faculty member, a student is required to do an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study. The student is expected to do literature survey and carry out development and/or experimentation. Through this the student has to exhibit both analytical and practical skills.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Unit-1 & Unit-2
P-2	15 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of P-1
P-3	20 Marks	Based on Unit-5 and around 30% from coverage of P-2
<i>supervisor</i> Marks for performance and Attendance	35 Marks	
Report	15 Marks	
Total	100 Marks	

Learning Resources:

1. Discussion and seminar materials can be obtained from supervisor, e-resources or from library (will be added from time to time): Digital copy will be available on the JUET server.
2. <https://nptel.ac.in/course.html>
3. <https://scholar.google.com/>

Text Book: As prescribed by respective supervisor faculty member

Course Description

Title: Recent advances in Construction materials
L-T-P scheme: 3-0-0

Code: 18B11CE917
Credit: 3

Prerequisite: Building materials and construction

Objective:

To introduce the advanced building materials used in the construction industry or being studied at the research level.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the various properties and uses of construction materials.
CO2	Describe the behavior of materials.
CO3	Develop the concepts of construction materials for appropriate field applications as per IS code requirements.
CO4	Identify the requirements of construction materials as per IS codes.
CO5	Demonstrate the structural aspects of different materials and the technicalities involved in construction methods.
CO6	Apply the concepts developed for the planning and construction of buildings.

Course Content:

Unit-1: Foams and lightweight materials, fiber reinforced concrete. Types of fibers, workability, mechanical and physical properties of fiber reinforced concrete,

Unit-2: Industrial waste materials in concrete, their influence on physical and mechanical properties and durability of concrete.

Unit-3: Concrete at high temperature, High strength concrete, changes in concrete with time, corrosion of concrete in various environments, corrosion of reinforcing steel, electrochemical process, measures of protection, Ferro-cement Architectural use, and aesthetics of composites.

Unit-4: materials and properties polymers Civil Engineering Polymers, fibers and composites, fiber-reinforced plastic in sandwich panicles, modeling.

Unit-5: Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers,

Unit-6: polymer foams and polymers in building physics, Polymer concrete composites.

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slide on Recent advances in Construction materials (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Interscience Publication by Broutman. A Wiley John Wiley & sons New York, 1996.
- 2 Engineering Materials by Rangwala S C Charotar Publishing house , Anand, 1985.
3. Weather Head R G “FRP Technology” Applied Science Publishers Ltd , London ,1998.
4. Civil Engineering Materials by Raina K B Tata McGraw- Hill Publishing Company Ltd, New Delhi, 1999.
5. Engineering Materials .by Budinski KG, Prentice Hall of India, New Delhi, 1985.

Reference Books/Material:

1. Concrete, Prentice-Hall, by P. K. Mehta, P J M Monteiro, New Jersey
- 2 Handbook of Concrete Mixes, Special Publications No 24 BIS New Delhi
3. EFNAARC Guidelines on SCC
4. ACI Special Publications
5. IS Specifications

Course Description

Title: Theory of Structures
L-T-P scheme: 3-0-0

Code: 18B11CE918
Credit: 3

Prerequisite: Engineering Mechanics, Mechanics of Solids, Structural Analysis-I

Objective:

To provide a more in-depth look at structural mechanics with emphasis on energy and matrix
Methods used for the analysis of structures

Learning Outcomes:

Course Outcome	Description
CO1	Outline and understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials
CO2	Identify various structural systems based on degrees of freedom and perform free vibration analysis
CO3	Analyze slender, long columns subjected to axial loads
CO4	Describe the structural aspects based on the results of the analysis.
CO5	Determine the stresses and strains in members subjected to Unsymmetrical Bending and Bending of Curved Bars
CO6	Apply the various theories to analyze the real-time problem.

Course Content:

Unit-1: Strain Energy. Theories of Elastic Failure. Gradually and suddenly applied Loads. Impact and Falling Loads. Deflection of Structures: Strain Energy Method for Deflection of Beams and Determinate Trusses, Castigliano's First Theorem and its Application to find Deflections

Unit-2: Columns and Struts: Long and Short Columns, Axial and Eccentric Loads. Euler's Theory and Rankine's Formula for Axially Loaded Columns. Eccentrically Loaded Columns, ISI-Formula for Columns, Introduction to Beam-Column behavior, and Column with Lateral Loads.

Unit-3: Unsymmetrical Bending: Principal Moment of Inertia, Unsymmetrical Bending of Standard Structural Section, Change in Orientation of Neutral axis-plane, Shear Centre.

Unit-4: Shells and pressure vessels: thin-walled cylindrical and spherical pressure vessels under internal and external radial pressure. Wire wound thin tubes

Unit-5: Curved Flexural Members: Circumferential Stresses in Curved Beam, Correction Factors for Straight Beams Formula, Radial Stresses in Curved Beams, Application to Closed Rings, and Chain Links. Bending of Curved Bars out of its Plane of Initial Curvature Application to Beams Curved in Plain. Springs: closed coiled and open coiled helical springs. Stress in the spring materials. Stiffness of springs, spring subjected to axial loads and couples. Grouping of springs

Unit-6: Basics of Mechanical Vibration: Signal degree of freedom system: Free & Forced vibration, Linear viscous damper, Coulomb Damper, response Harmonic Excitation Rotation Unbalance & support Excitation, Vibration isolation, and Transmissibility. Single Degree of freedom system as vibrometer accelerometer

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2, Unit-3, and Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5, around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on the Theory of structures (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain, and Dr. Arun Kumar Jain.
3. Strength of Materials by R. Subramanian, Oxford University Press

Reference Books/Material:

1. Mechanics of material by R.C. Hibbeler, Prentice-Hall publications.
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice-Hall publications.
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers.
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press

Course Description

Title: Special Reinforced Concrete Structures.
L-T-P scheme: 3-0-0

Code: 18B11CE919
Credit: 3

Prerequisite: Design of Concrete Structures

Objective: To familiarize students with special RC structures other than beam, column and slabs. Students will also learn about design of different solid and water retaining structures.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the governing factors for the design of a given structure.
CO2	Describe the step by step procedure for the design of a given member.
CO3	Develop the detailing concepts of structures.
CO4	Identify the permissible limits for the design of a specific structure.
CO5	Apply the codal provision for the design of structures.
CO6	Understand the structural behavior of special structures.

Course Content:

Unit-1: Introduction: Review of Limit State Design of Beams, Slabs & Columns according to IS 456-2000

Unit-2: Design of special rc elements: Design of Slender Columns,

Unit-3: Grid Floors, Curved Beams, Deep Beams, Plain & Reinforced Concrete Walls, Retaining Wall. Slabs: Design of Circular & Flat Slabs. Yield Line Analysis of Slabs.

Unit-4: Bunker and silos

Unit-5: water tanks: Rectangular Water Tanks, Circular Water Tanks,

Unit-6: Overhead and Underground Water Tanks.

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.

- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4, Unit-5, and Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Advanced Concrete Technology (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Advanced Reinforced Concrete Design, by N.Krishna Raju (CBS Publishers & Distributors),
2. Advanced Reinforced Concrete Design, by P.C.Varghese (Prentice Hall of India)
3. IS3370 (Part I to IV) "Code of Practice for the storage of Liquids", Bureau of Indian Standards.

Reference Books/Material:

1. Concrete, Prentice Hall, by P. K. Mehta, P J M Monteiro, New Jersey
- 2 Handbook of Concrete Mixes, Special Publications No 24 BIS New Delhi
3. EFNAARC Guidelines on SCC
4. ACI Special Publications
5. IS Specifications

Course Description

Title: Finite Element Methods
L-T-P scheme: 3-0-0

Code: 18B11CE920
Credits: 3

Prerequisite: Structural Analysis

Objective:

The objective of this course is to introduce the fundamentals of finite element methods and apply the same to the real world problems.

Learning Outcomes:

Finite Element Methods	
CO1	Outline the concepts used in finite element method
CO2	Identify suitable steps to solve a given problem for any shape of structure for static problems.
CO3	Analyze the results obtained by solving the given problem.
CO4	Describe the algorithm to solve 2D static problems.
CO5	Determine the finite element solution for axisymmetric problems.
CO6	Apply the finite element concept to analyze the real time problem.

Course Content:

Unit 1: Introduction, Matrix-Displacement Formulation, Element Shapes, Nodes, Nodal Unknowns and Coordinate Systems, Shape Functions, Strain-Displacement Matrix.

Unit 2: Assembly Stiffness Equation - Direct Approach, Galerkin's Method, Virtual Work Method, Variational Method.

Unit 3: Applications of FEM in Civil Engineering 1-D Static Problems: Rod, String, Beam, Shaft One-dimensional Formulations; Boundary Conditions; Solution Algorithms;

Unit 4: Discretization; Stress Deformation Analysis 2-D Static Problems: Plane Stress, Plane Strain, Axisymmetric Problems, Stability of Columns and Thin Plates Two-dimensional Formulations; Boundary Conditions; Solution Algorithms.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Finite Element Method (will be added from time to time): Digital copy will be available on the JUET server.

Text Books

1. J.N.Reddy, An Introduction to the Finite Element Method, 3rd Edition, Tata McGraw-Hill, 2005.
2. P. Seshu, Text Book of Finite Element Analysis, Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

References:

1. C.S. Krishnamoorthy, Finite Element Analysis, Tata McGraw-Hill
2. David V. Hutton, Fundamentals of Finite Element Analysis, McGraw Hill
3. H. C. Martin and G. F. Carey, Introduction to Finite Element Analysis - Theory and Application, NewYork, McGraw-Hill
4. Irving H.Shames, Clive L. Dym,Energy and Finite Element Methods in Structural Mechanics; New Age International
5. K. J.Bathe, Finite Element Procedures, Prentice-Hall of India, New Delhi, India M.
6. Mukhopadhyay, Matrix, Finite Element, Computer and Structural Analysis, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi, India
7. O. C. Zienkiewicz and Y.K. Cheung, The Finite Element Method in Structural and Soild Mechanics, McGraw Hill, London

Course Description

Title: Earthquake Engineering
L-T-P scheme: 3-0-0

Code: 18B11CE921
Credit: 3

Prerequisite: Mechanics of Solids, Structural Analysis I & II, Design of Reinforced Concrete Structure

Objective:

1. Introduce the basic concepts in dynamic and probabilistic modeling of earthquake loading and dynamic analyses/simulation with uncertainty in earthquake engineering.
2. Introduce the basics of structural dynamic analyses with emphasis on earthquake engineering applications. Introduce the basics of probabilistic assessment of seismic hazard and structural reliability.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the nature and characteristics of the earthquake.
CO2	Identify various structural systems based on degrees of freedom and perform free vibration analysis.
CO3	Analyze the multi-storied buildings with seismic coefficient and response spectrum methods.
CO4	Describe the significance of ductility in the design of multi-storeyed structures
CO5	Enumerate various seismic design principles as per Indian standard codes.
CO6	Design reinforced concrete buildings according to the capacity design principle.

Course Content:

Unit-1: Nature of Earthquakes

Plate Tectonics Theory, Faults and fault movements, Magnitude of earthquakes, Intensity scaling of earthquakes: subjective intensity and instrumental intensity, Characteristics of earthquake ground motions

Unit-2: Response of Simple Structures to Earthquake Ground Motions:

Seismic response of linear elastic single degree of freedom (SDOF) systems, Seismic response of inelastic SDOF systems Response spectra

Unit-3: Response of Multi Degree of Freedom Systems (MDOF) To Earthquake Ground Motions

Unit-4: Seismic Design Principles:

Earthquake design philosophy, Design spectrum, Earthquake resistance of building systems, Response modification factors

Unit-5: Seismic Code Procedures:

Classification of building systems, Selection of analysis procedure, Capacity design principles for reinforced concrete buildings,

Unit-6: Case study: analysis and design of a multistory R/C frame

Teaching Methodology:

- At the start of the course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.
- There will be assignments and quizzes at regular intervals, where students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4, Unit-5, and Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slide on Earthquake Engineering (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Earthquake Resistant Design of Structures by Pankaj Agarwal & Manish Shrikhande, Prentice Hall India.
2. Earthquakes by B. Bolt. Freeman, 1993.
3. Dynamics of Structures by A. Chopra. Prentice-Hall, 1995.
4. Seismic Design of Reinforced Concrete and Masonry Buildings by T. Paulay and M.J.N. Priestley, J. Wiley, 1992
5. B. I.S., Codes No. IS: 1893-2002, IS: 4326-1993, IS: 13920-1993
6. Park & Pauly; Behaviour of RC structure
7. John M. Biggs; Introduction to Structural Dynamics

Reference Books/Material:

1. Dynamics of Structures by Clough R.W. and Penzien J., McGraw-Hill, 2nd edition, 1992
2. Fundamentals of Earthquake Engineering by Newmark N.M. and Rosenblueth E., Prentice-Hall, 1971.
3. C V R Murthy - Earthquake Tips, NICEE
4. IITK-GSDMA EQ26 – V -3.0 Design Example of a Six Storey Building

Web References:

- [1] https://www.nicee.org/IITK-GSDMA_Codes.php
- [2] <https://nptel.ac.in/course.html>

Journals References:

- [1] Journal of Earthquake Engineering
- [2] Journal of structural Engineering
- [3] Journal of seismology
- [4] Journal of Earthquake Engineering & structural dynamics

IS Codes:

- Criteria for earthquake resistant design General provision & Building - IS: 1893 (Part I) - 2002
- Code of Practice for Ductile Detailing of RC Structures - IS: 13920 (1993).
- Code of Practice for earthquake resistant design & Construction of buildings – IS 4326 (1993).
- Improving Earthquake Resistance of Earthen Buildings - IS 13827(1993)-
- Guide lines for Improving Earthquake Resistance low strength masonry buildings - IS:13828 (1993)

Course Description

Title: Design of Industrial Structures
L-T-P scheme: 3-0-0

Code: 18B11CE922
Credits: 3

Prerequisite: Design of Concrete Structures and Design of Steel Structures

Objective:

The objective of this course is to acquaint the student with knowledge about different types of industrial structures, their analysis and design for different conditions as per codal provision.

Learning Outcomes:

Course Content:

Design of Industrial Structures	
CO1	Outline the concepts used in planning of industrial structures.
CO2	Identify suitable steps to design thin walled steel members.
CO3	Analyze RC Bunkers & Silos.
CO4	Describe the parts of RC Intz tanks.
CO5	Determine the load calculations for RC chimneys.
CO6	Apply the design principles of shells for various roof structures.

Unit 1: Planning of Industrial Structures – types of industrial structures – different components of industrial structures – Bracings of Industrial Buildings – Design of Steel Industrial Buildings.

Unit 2: Thin Walled / Cold Formed Steel Members : Definitions – Local Buckling of Thin-Elements Post Buckling of Thin-Elements – Light Gauge Steel Columns and Compression Members – Form-Factor for Columns and Compression Members – Behavior of Stiffened Elements Under Uniform Compression – Multiple Stiffened Compression Elements –Effective Length of Light Gauge Steel Compression Members – Light Gauge Steel Tension Members.

Unit 3: RC Bunkers & Silos: Introduction – Janssen's Theory – Airy's Theory – Design of Square, Rectangular and Circular Bunkers ; Design of Silos.

Unit 4: RC Intz Tanks – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation.

Unit 5: RC Chimneys : Introduction – Wind Pressure – Stresses in Chimney Shaft Due to Self Weight and Wind – Stresses in Horizontal Reinforcement Due to Wind Shear – Stresses Due to Temperature Difference – Combined Effect of Self Load, Wind and Temperature – Temperature Stresses in Horizontal Reinforcement Problems.

Unit 6: Design Principles of Cylindrical Shells & Design Problems.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Design of Industrial structures (will be added from time to time):
Digital copy will be available on the JUET server.

Text Books

1. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, "Design of Steel Structure", 2nd Edition, Lakshmi Publishers, 1998.
2. Punmia B.C, Ashok Kr. Jain, Arun Kr. Jain, "RCC Designs (Reinforced Concrete Design)", 10th Edition, Lakshmi Publishers, 2006.
3. Ram Chandra, "Design of Steel Structures", 12th Edition, Standard Publishers, 2009.

References:

1. Advanced Reinforced Concrete Design, By N. Krishna Raju (CBS Publishers & Distributors) 2005.
2. Design of Steel Structures, By Ram Chandra and Virendra Gehlot vol-II, 2007.
3. Design of Steel Structures, By Duggal - Tata McGraw-Hill publishers – 2010

Course Description

Title: Project Oriented Practice

L-T-P scheme: 0-0-4

Code: 18B17CE971

Credits: 2

Prerequisite: Students must have already studied the basic CE courses and have explored the various dimensions of it.

Objective:

1. Students will be able to identify/formulate project problem.
2. Students will be able to write a review paper in the format of standard journal/transactions related to a particular topic.
3. Students will be able to present his work as per standard way of presentation.

Learning Outcomes:

Course Outcome	Description
CO1	Interpret data from research papers
CO2	Analyze seminar and presentations
CO3	Development of the theoretical model analysis of the planned work.
CO4	Develop writing skill for competence- technical report, design aspects, social issues, etc.
CO5	Conduct conversation practice: face to face and via media.
CO6	Write report on the basis of study carried out

Course Content

UNIT-1 Literature survey and review, the process of research, Formulation of a research problem, Experimental design –Classification. Theoretical research, Formulating a problem, verification methods, modelling and simulations, ethical aspects, IPR issues, Copyrights and Patenting etc.

UNIT-2 student is required doing an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study.

UNIT-3 Research Problem identification, Probable solutions, verification of the proposed methodology, conclusions. Meaning, Need and Types of research design, Research Design Process, Measurement and scaling techniques, Data Collection – concept, types and methods, Processing and analysis of data, Design of Experiment

UNIT-4 Quantitative Techniques Sampling fundamentals, Testing of hypothesis using various tests like Multivariate analysis, Use of standard statistical software, Data processing, Preliminary data analysis and interpretation.

UNIT-5 Research Communication, Writing a conference paper, Journal Paper, Technical report, Dissertation/thesis writing. Presentation techniques, Patents and other IPRs, software used for report writing such as WORD, Latex etc

Teaching Methodology: Dissertation is a course requirement wherein under the guidance of a faculty member, a student is required to do an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study. The student is expected to do literature survey and carry out development and/or experimentation. Through this the student has to exhibit both analytical and practical skills.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Unit-1 & Unit-2
P-2	15 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of P-1
P-3	20 Marks	Based on Unit-5 and around 30% from coverage of P-2
<i>supervisor</i> Marks for performance and Attendance	35 Marks	
Report	15 Marks	
Total	100 Marks	

Learning Resources:

1. Discussion and seminar materials can be obtained from supervisor, e-resources or from library (will be added from time to time): Digital copy will be available on the JUET server.
2. <https://nptel.ac.in/course.html>
3. <https://scholar.google.com/>

Text Book: As prescribed by respective supervisor faculty member

Course Description

Title: Building planning and drawing
L-T-P scheme: 3-0-0

Code: 18B11CE923
Credit: 3

Prerequisite: Building materials and construction

Objective:

The objective of this course is to introduce the conventional building materials and techniques used in civil engineering construction.

Learning Outcomes:

Course Outcome	Description
CO1	Outline and understand basic principles of building design and planning
CO2	Develop the necessary drawing skills; create multilayer architectural and working drawing
CO3	Describe the Guidelines for staircases and its planning
CO4	Identify Plan a building following the bye-laws
CO5	Demonstrate the Specifications for Truss and roof Drawings.
CO6	Apply the building drawings concept to discover and develop ideas for designing residential, commercial, and public buildings.

Course Content:

Unit-1: Drawing Standards- Guidelines for Building Drawing, General convention, for showing different materials in section, Thumb rules for effective planning,

Unit-2: Building Bye-Laws, Specifications of Buildings.

Unit-3: Stairs and Double Storeyed Buildings – Terminology, Guidelines for staircases are planning, Different types of Stairs, Specifications.

Unit-4: Doors and Windows – Guidelines for selecting Doors and Windows, Terminology.

Unit-5: Inclined roof buildings – Terminology, Problems on inclined roof buildings.

Unit-6: Specifications for Truss Drawings, Problems on Trusses.

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.

- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carry marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4, Unit-5, and Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slide on Building planning and drawing (will be added from time to time):
Digital copy will be available on the JUET server.

Text Book:

1. 'Building Drawing Book by C. M. Kale, M. G. Shah, and S. Y. Patki
2. "Building Construction," by Jha, J. & Sinha, S.K., Khanna Publishers, Delhi
2. Building Drawing: With an Integrated Approach to Built Environment Book by C. M. Kale, M. G. Shah, and S. Y. Patki
4. "A Text Book of Engineering Construction", by Kulkarni, C. J. Ahmedabad Book Depot, Ahmedabad.
3. Civil Engineering Drawing And House Planning Book by B. P. Verma

Reference Books/Material:

1. "Building Design & Drawing Book by A D Pawar and V S Limaye

Course Description

Title: Estimation of Building and Roads
L-T-P scheme: 3-0-0

Code: 18B11CE924
Credit: 3

Prerequisite: Building materials and construction

Objective:

- Determination of quantities of items and labour requirement of civil engineering works.
- Preparation of estimate of the civil engineering works.
- Preparation of specification of construction items.
- To introduce the students to depth knowledge of professional practice as well the quantity
- Analysis of construction works like multi-storied structures, Waterworks & sanitary works, Irrigation works, Road estimates, culverts, et.

Learning Outcomes:

Course Outcome	Description
CO1	Outline diverse knowledge of estimating, costing, and professional practice, which will be used to tackle real-life problems.
CO2	Develop the ability to identify, formulate, and solve engineering problems
CO3	Describe and understand the procedure to carry out the estimation and steps to prepare reports of construction works.
CO4	Identify the purpose and importance of valuation
CO5	Demonstrate the structural aspects of different materials and the technicalities involved in construction methods.
CO6	Apply the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Content:

Unit-1: Procedure for Estimating

Unit-2: Methods of Building Estimate, Estimates of Buildings

Unit-3: Estimate of different types of roofs

Unit-4: Estimates R.C.C. work and structures

Unit-5: Estimates of Sanitary and Water supply works,

Unit-6: Road Estimating

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2, Unit-3 & around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4, Unit-5, and Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on an estimation of buildings and roads (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. B. N. Dutta, Estimating and Costing In Civil Engineering, UBS Publishers Distributors Ltd.
2. S. C. Rangwala, Estimating And Costing, Charotar Publishing House, Anand
3. G. S. Biridi, Textbook of Estimating & Costing, Dhanapat Rai & Sons. Delhi.
4. M.Chakroborti, Estimating, Costing, Specification, and Valuation.Calcutta.
5. P.W.D. Hand Book Is Codes

Reference Books/Material:

1. Patil, B.S., Civil Engineering Contracts, Vol. – I, Orient Longman Publication, 1998.

2. Rangwala, S.C., Elements of Estimating and Costing, Professional practice, Charotar Publishing House, Anand.
3. Aggarwal, A., Upadhyay, A.K., Civil Estimating, Costing &Valuation, S.K Kataria & Sons, New Delhi.
4. Chandola, S.P., and Vazirani Estimating and Costing, Khanna Publication

Course Description

Title: Quantity Surveying of Bridges and Hydraulic Structures
L-T-P scheme: 3-0-0

Code: 18B11CE925
Credit: 3

Prerequisite: Building materials and construction, estimation of buildings and roads

Objective:

- Determination of quantities of items and labour requirement of civil engineering works.
- Preparation of estimate of the civil engineering works.
- Preparation of specification of construction items.
- To introduce the students to depth knowledge of professional practice as well the quantity
- Analysis of construction works like multi-storied structures, Waterworks & sanitary works, Irrigation works, Road estimates, culverts, et.

Learning Outcomes:

Course Outcome	Description
CO1	Outline diverse knowledge of estimating, costing, and professional practice, which will be used to tackle real-life problems.
CO2	Develop the ability to identify, formulate, and solve engineering problems
CO3	Describe and understand the procedure to carry out the estimation and steps to prepare reports of construction works.
CO4	Identify the purpose and importance of valuation
CO5	Demonstrate the structural aspects of different materials and the technicalities involved in construction methods.
CO6	Apply the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Content:

Unit-1: Culvert- methods of estimating, estimates of R.C.C slab culvert, culvert with varying span arch culvert.

Unit-2: Estimation of pipe culvert, well foundation, R.C.C T- beam bridge

Unit-3: Estimate of earthwork in canal – different cases,

Unit-4: estimation of earthwork in an irrigation channel, an estimate of permanent land and temporary land, estimate of distributary, estimate of aqueduct, syphon, village road culvert

Unit-5: Analysis of rates in building works , specification- general specification, and detailed specification.

Unit-6: rules and methods of measurement: general rules: earthwork: concrete: brickwork: woodwork plastering pointing, whitewashing, color washing

Purpose of valuation, types of property- Depreciation, Sinking fund, Leasehold and freehold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value, and year's purchase. Rental method of valuations, and typical problems

Teaching Methodology:

- At the start, of course, the course delivery pattern, prerequisite of the subject will be discussed.
- The lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures that carry marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments and quizzes at regular intervals. Students can build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2
Test-2	25 Marks	Based on Unit-3, Unit-4 & around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5, and Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on an estimation of buildings and roads (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. B. N. Dutta, Estimating and Costing In Civil Engineering, UBS Publishers Distributors Ltd. 2.
2. S. C. Rangwala, Estimating And Costing, Charotar Publishing House, Anand
3. G. S. Biridi, Textbook of Estimating & Costing, Dhanapat Rai & Sons. Delhi.
4. M.Chakroborti, Estimating, Costing, Specification, and Valuation.Calcutta.
5. P.W.D. Hand Book Is Codes

Reference Books/Material:

1. Patil, B.S., Civil Engineering Contracts, Vol. – I, Orient Longman Publication, 1998.
2. Rangwala, S.C., Elements of Estimating and Costing, Professional practice, Charotar Publishing House, Anand.
3. Aggarwal, A., Upadhyay, A.K., Civil Estimating, Costing &Valuation, S.K Kataria & Sons, New Delhi.
4. Chandola, S.P., and Vazirani Estimating and Costing, Khanna Publication

Course Description

Title: Construction Contracts and Laws
L-T-P scheme: 3-0-0

Code: 18B11CE926
Credits: 3

Prerequisite:

Objective:

To learn how to prepare the contract and bidding documents for various construction work. This course will enhance the knowledge of liability, mechanics liens, litigation and arbitration through the Indian and international contracts act.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various contracts and bidding documents for any proposed construction work.
CO2	Identify the disputes and disputes resolutions according construction laws.
CO3	Analyze features-suitability-design of contract documents
CO4	Describe tendering and bidding-accepting-evaluation of tender, formation and interpretation, potential contractual problems.
CO5	Determine arbitration, comparison of actions and laws, agreements, conditions of arbitrations, powers and duties of arbitrator, rules of evidence.
CO6	Apply legal requirements, insurance and bonding, laws governing sale, purchase and use of urban and rural land, land revenue codes and taxes.

Course Content:

Unit-1

Basics of the legal system including contracts, torts, land zoning and property ownership, bonds and insurance, bidding, subcontracting, contractor liability, mechanics liens, litigation and arbitration,

Unit-2

Indian and international construction law, hazardous waste issues and labor laws, disputes and disputes resolutions, case studies.

Unit-3

Indian contract act, elements, types, features-suitability-design of contract documents, international contract document, law of torts;

Unit-4

Tenders: prequalification bidding-accepting-evaluation of tender, formation and interpretation, potential contractual problems, world bank procedures and guidelines;

Unit-5

BOT projects, arbitration, comparison of actions and laws, agreements, conditions of arbitrations, powers and duties of arbitrator, rules of evidence, Dispute Redressal Boards(DRB),

Unit-6

Laws: legal requirements, insurance and bonding, laws governing sale, purchase and use of urban and rural land, land revenue codes, tax laws, income tax, sales tax, excise and customs duties, legal requirements for planning, property law, agency law, local government laws for approval, statutory regulations.

Teaching Methodology:

- At the start of course, the course delivery pattern, importance of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2,3, & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Lecture slides and study materials on contracts and tender documents (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Gajaria G.T., "Laws Relating to Building and Engineering" Contracts in India.
2. Jimmie Hinze, "Construction Contracts", McGraw Hill, 2001.
3. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2000.
4. Kwaku, A. Tenah, P.E. Jose M. Guevara, P.E., "Fundamentals of Construction Management and Organisation", Printice Hall, 1985. M.M> Tripathi Private Ltd., Bombay, 1982.
5. Patil, B.S., "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2006.

Course Description

Title: Construction Financial Management
L-T-P scheme: 3-0-0

Code: 18B11CE916
Credit: 3

Prerequisite: Estimation and Planning of project.

Objective:

To study the concepts of Construction Economic and Finance such as comparing alternatives proposals, evaluating alternative investments, management of funds, and management of accounting.

Learning Outcomes:

Course Outcome	Description
CO1	Define theoretical and practical aspects of project management techniques to achieve project goals.
CO2	Possess organizational and leadership capabilities for effective management of construction projects.
CO3	Apply knowledge and skills of modern construction practices and techniques.
CO4	Have necessary knowledge and skills in accounting, financing, risk analysis and contracting.
CO5	Capable of using relevant software packages for planning, scheduling, executing and controlling of construction projects.
CO6	Able to adopt advanced technologies and management approaches.

Course Content:

UNIT I- Time Value of Money – Cash Flow diagram – Nominal and effective interest-continuous interest. Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)– Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient(G), Geometric Gradient (C).

UNIT II- Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR)Analysis, Benefit/Cost Analysis, Break Even Analysis.

UNIT III-Real Estate - Investment Property, Equipment Replace Analysis, Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.

UNIT IV -Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management-foreign currency management.

UNIT V- Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks
- Internal exam of 30 marks will be conducted as a part of mid semester evaluation. Experiments shall be performed in the field related to course contents.
- The course includes a practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on & Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Study material of Web Technology Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:

1. Blank, L.T., and Tarquin,a.J (1988) Engineering Economy,4th Edn. Mc-Graw Hill Book Co.
2. Collier C and GlaGola C (1998) "Engineering Economics & Cost Analysis", 3rd Edn. Addison Wesley Education Publishers.
3. Patel, B M (2000) "Project management- strategic Financial Planning, Evaluation and Control", Vikas Publishing House Pvt. Ltd. New Delhi.
4. Shrivastava,U.K., (2000)"Construction Planning and Management",2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi.
5. Steiner, H.M. (1996) "Engineering Economic principles", 2nd Edn. Mc-Graw Hill Book

Course Description

Title: Quality Assurance & Quality Control
L-T-P scheme: 3-0-0

Code: 18B11CE927
Credits: 3

Prerequisite: Nil

Objective:

The objective of this course is to introduce the fundamentals of finite element methods and apply the same to the real world problems.

Learning Outcomes:

CO1	Outline the concepts used in finite element method
CO2	Identify suitable steps to solve a given problem for any shape of structure for static problems.
CO3	Analyze the results obtained by solving the given problem.
CO4	Describe the algorithm to solve 2D static problems.
CO5	Determine the finite element solution for axisymmetric problems.
CO6	Apply the finite element concept to analyze the real time problem.

Course Content:

Unit 1: Introduction, Roles & responsibilities of quality assurance manager, Introduction to the ISO 9000 series of standards, Interpret the requirement of ISO 9001:2015 standards, Barriers in quality system.

Unit 2: International codes & Indian codes, Standards & specifications, Drawings & abbreviations, Excavation & back filling

Unit 3: Quality objectives and Quality policy, Development of company / organization quality systems,

Unit 4: Preparation of Procurement Plan, Preparation of quality manuals, Maintenance organization quality systems, Develop and manage the internal quality audits program.

Unit 5: QA/QC aspects of Pavement layers, buildings, bridges and other structures.

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, white board, OHP etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments, quizzes at regular interval, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials and lecture slides on Finite Element Method (will be added from time to time): Digital copy will be available on the JUET server.

Text Books

1. Quality Assurance and Quality Control in the Analytical Chemical Laboratory: A Practical Approach, Second Edition, Book by Jacek Namieśnik and Piotr Konieczka. (2009)
2. Construction inspection handbook, Book by James O'Brien. (1974)
3. Introduction to Statistical Quality Control, Student Resource Manual, Book by Douglas C. Montgomery. (1985)

References:

1. Perfect: Quality Assurance & Quality Control, Book by Ram Babu Sao. (2016)
2. Quality audits for improved performance, Book by Dennis R Arter. (1989)
3. Total quality control, Book by Armand V. Feigenbaum. (1961)

Course Description

Title: Project Oriented Practice

L-T-P scheme: 0-0-4

Code: 18B17CE971

Credits: 2

Prerequisite: Students must have already studied the basic CE courses and have explored the various dimensions of it.

Objective:

1. Students will be able to identify/formulate project problem.
2. Students will be able to write a review paper in the format of standard journal/transactions related to a particular topic.
3. Students will be able to present his work as per standard way of presentation.

Learning Outcomes:

Course Outcome	Description
CO1	Interpret data from research papers
CO2	Analyze seminar and presentations
CO3	Development of the theoretical model analysis of the planned work.
CO4	Develop writing skill for competence- technical report, design aspects, social issues, etc.
CO5	Conduct conversation practice: face to face and via media.
CO6	Write report on the basis of study carried out

Course Content

UNIT-1 Literature survey and review, the process of research, Formulation of a research problem, Experimental design –Classification. Theoretical research, Formulating a problem, verification methods, modelling and simulations, ethical aspects, IPR issues, Copyrights and Patenting etc.

UNIT-2 student is required doing an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study.

UNIT-3 Research Problem identification, Probable solutions, verification of the proposed methodology, conclusions. Meaning, Need and Types of research design, Research Design Process, Measurement and scaling techniques, Data Collection – concept, types and methods, Processing and analysis of data, Design of Experiment

UNIT-4 Quantitative Techniques Sampling fundamentals, Testing of hypothesis using various tests like Multivariate analysis, Use of standard statistical software, Data processing, Preliminary data analysis and interpretation.

UNIT-5 Research Communication, Writing a conference paper, Journal Paper, Technical report, Dissertation/thesis writing. Presentation techniques, Patents and other IPRs, software used for report writing such as WORD, Latex etc

Teaching Methodology: Dissertation is a course requirement wherein under the guidance of a faculty member, a student is required to do an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study. The student is expected to do literature survey and carry out development and/or experimentation. Through this the student has to exhibit both analytical and practical skills.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Unit-1 & Unit-2
P-2	15 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of P-1
P-3	20 Marks	Based on Unit-5 and around 30% from coverage of P-2
<i>supervisor</i> Marks for performance and Attendance	35 Marks	
Report	15 Marks	
Total	100 Marks	

Learning Resources:

1. Discussion and seminar materials can be obtained from supervisor, e-resources or from library (will be added from time to time): Digital copy will be available on the JUET server.
2. <https://nptel.ac.in/course.html>
3. <https://scholar.google.com/>

Text Book: As prescribed by respective supervisor faculty member