

FIRST SEMESTER

Course Description

Course Name: Engineering Mathematics-I

L-T-P scheme: 3-1-0

Course Code: MA101

Credits: 4

Prerequisite: Students should have basic knowledge of Algebra and calculus.

Objective: This course is aimed:

- To introduce the calculus of functions of two variables and applicability of derivatives and integrals of vector functions to Analytical geometry and physical problems.
- To make students aware of the basic mathematical concepts and methods which will help them in learning courses in engineering and Technology.

Learning Outcomes:

Course Outcome	Description
CO1	Understand the rank, eigen values, eigen vectors, diagonalization of matrix; compute inverse of matrix by Caley-Hamilton theorem.
CO2	Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, and solve it by Gauss elimination method.
CO3	Interpret derivatives and integrals of multivariable functions geometrically and physically; implement multivariable calculus tools in engineering, science, optimization, and understand the architecture of surfaces in plane and space etc.
CO4	Know about piecewise continuous functions, Laplace transforms and its properties; use of Laplace transform and inverse transform for solving initial value problems.
CO5	Realize importance of line, surface and volume integrals, Gauss and Stokes theorems and apply the concepts of vector calculus in real life problems.
CO6	Formulate mathematical models in the form of ordinary differential equations and learn various techniques of getting solutions of linear differential equations of second order.

Course Contents:

Unit 1: Algebra of matrices, Determinants, Rank, Gauss elimination method, Eigen values and vectors. Quadratic forms.

Unit 2: Partial differentiation. Taylor's series. Maxima and minima. Jacobians, Double integrals,

Unit 3: Differential Equations with constants coefficients.

Unit 4: Gradient, divergence and curl. Line and surface integrals, Normal and tangent to a surface. Gauss and Stokes theorems, Equations to a line, plane, curve and surfaces.

Unit 5: Laplace transforms.

Methodology:

The course will be covered through lectures supported by tutorials. There shall be 3 Lectures per week where the teacher will explain the theory, give some examples supporting the theory and its applications. About 12 Tutorial Sheets covering whole of the syllabus shall be given. Difficulties and doubts shall be cleared in tutorials. Apart from the discussions on the topics covered in the lectures, assignments/ quizzes in the form of questions will also be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Syllabus covered upto Test-1
Test-2	25 Marks	Syllabus covered upto Test-2
Test-3	35 Marks	Full Syllabus
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials, lecture slides and books on mathematics-1 will be available on the JUET server.

Books

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley Publishers.
2. Lipschuts, S., Lipsom M.: Linear Algebra, 3rd Ed, Schaum series 2001.
3. B. V. Raman: Higher Engineering Mathematics, McGraw-Hill Publishers.
4. R.K. Jain, S.R.K. Iyenger: Advanced Engineering Mathematics, Narosa Publishing House, New Delhi.
5. Thomas, G.B., Finney, R.L.: Calculus and Analytical Geometry, 9th Ed., Addison Wesley, 1996.
6. Grewal, B.S. : Higher Engineering Mathematics, Khanna Publishers Delhi.

Title of Course: Engineering Physics-I
L-T Scheme: 3-1-0

Course Code: PH103
Course Credits: 4

Objective: Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters. The course intends to impart sufficient scientific understanding of different phenomena associated with Special relativity, Modern Physics, Statistical physics, atomic physics, and lasers.

Course Outcomes:

Course Outcome	Description
CO1	Describe the limitations of Newton's laws and explain when special relativity become relevant, Learn to Apply the principles of Special Relativity to an extended range of problems involving particle kinematics
CO2	Demonstrate the ability to explain the concepts related to the consequences of Special Relativity, the nature of space-time and related dynamic observables
CO3	Acquired a profound understanding of inadequacy of classical mechanics regarding phenomena related to microscopic level, Become well versed with the experimental developments, historical account and importance of probabilistic interpretation
CO4	Understand the basic quantum mechanical ideas and relevant mathematical framework, approach the solution of one dimensional time independent Schrodinger equation
CO5	Appreciate the importance of applying statistical ideas to explore thermodynamic variables, Developed ability to identify and apply appropriate statistical method for describing the assembly of microscopic particles, comprehend basic properties and working of Laser systems

Course Contents:

Unit-I (Theory of Special Relativity): Frames of reference, Galilean transformation, Michelson Morley Experiment, Postulates of special theory of relativity, time dilation and length contraction, twin paradox, Lorentz transformations, addition of velocities, Relativistic Doppler effect, Mass variation with velocity, Mass-energy relation.

Unit-II (Introduction to Modern Physics):

Quantization of Radiation, Black body radiation, Rayleigh-Jeans law, Planck's law of radiation Wien's law, Stefan's law, Photoelectric effect Compton scattering, Atomic spectra, Bohr model of hydrogen atom, Frank hertz experiment, Matter waves, de Broglie hypothesis, Davisson Germer experiment

Unit III Quantum Mechanics

Wave packets, phase and group velocity, Heisenberg's uncertainty principle, Schrödinger wave equation and its applications to the free particle in a box, potential barrier and Harmonic oscillator

Unit-IV (Statistical Mechanics): Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distributions and their applications.

Unit- V Laser Physics & Applications

Fundamental ideas of stimulated and spontaneous emission, Einstein's coefficients, Principle and working of laser, Different types of lasers (He-Ne Laser, Ruby Laser, Semiconductor Laser), Applications of Lasers

Text Books and References:

1. A. Beiser, Perspectives of Modern Physics, Tata McGraw Hill.
2. J R Taylor, C D Zafiratos, M A Dubson, Modern Physics for Scientist & Engineers, Pearson Education.
2. K Krane, Modern Physics, Wiley India
3. J Bernstein, P M Fishbane, S. Gasiorowicz, Modern Physics, Pearson Education.
5. B. B. Laud, Laser and Non-Linear Optics, New Age International (P) Ltd.
6. R. Resnick, Relativity, New Age.

Title: English
L-T-P scheme: 2-1-0
Prerequisite: None

Code: HS101
Credit: 3

Objective:

1. To enable understanding of basics of communication in Business environment.
2. To provide insight into structural aspect of communication in business.
3. To impart knowledge about communication theory and develop skills in oral and non verbal communication.
4. To improve skills as critical readers, thinkers, listener and writer.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic concept of verbal/ nonverbal skills to understand the role of effective communication in personal & professional success.
CO2	Describe drawbacks in listening patterns and apply listening techniques for specific needs.
CO3	Develop the understanding to analyze, interpret and effectively summarize a variety of textual content
CO4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus.
CO5	Create effective presentations
CO6	Create professional and technical documents that are clear and adhering to all the necessary convention.

Course Content:

Unit-1: Concept and Nature of Communication : Definition of Communication, Process & Stages of Communication, Barriers to Communication, Channels of Communication.

Unit-2: Listening Skills: The listening process, Importance of listening, Purpose and types of listening, Hearing and listening, Listening with a purpose, Barriers to listening.

Unit-3: Speaking/Oral Skills: Importance of acquiring oral skills, Visual aids, Body Language, Delivery, Pronunciation, Use of connectives Organization of matter: Metadiscourse features, Textual organization, 7 C'S of effective communication , Improving vocabulary by learning Root words in English, Some foreign words, Reading comprehension, Some important synonyms and antonyms, commonly confused words, Etiquettes & grooming.

Unit-4: Reading Skills: Skimming and Scanning, Intensive and extensive reading, SQ3R Technique

Unit-5: Writing Skills: Business letters, Memo, Circulars, Notices, Report writing, resume writing, Agenda & Minutes writing, Tips on clear writing Translation- Hindi to English, Translation -English to Hindi.

Unit-6: Introduction to Modern Communication Media: Technology based communication tools, Committee types, Advantages, Conferences, Audio-video conferencing, Barriers and overcoming negative impact.

Unit-7: Public Speaking and Interviewing Strategies: Speech Preparation, Theory of group discussion, Participation in Group discussion, Oral presentation, Power point presentation ,Tips for successful job interview, Do's and don'ts while appearing for interview, Mock interview, Some interview questions, Telephonic interview tips, Resume writing

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 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-7 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Teaching Methodology:

The course will be taught with the aid of lectures, handouts, case studies, Task-based language learning, and comprehensive language learning through language lab.

Learning Resources:

Lecture slides and e-books on ENGLISH (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. K.K. Sinha- Business Communication (Galgotia Publications)

Reference Books:

1. R.C. Bhatia- Business Communication (Ane Books Pvt. Ltd.)
2. P.D. Chaturvedi – Business Communication (Pearson Education, 1st Edition 2006).
3. Lesikar RV & Pettit Jr. JD – Basic Business Communication: Theory & Application (Tata Mc Graw Hill, 10th Edition)
4. Wren & Martin, High School English Grammar & Composition – S. Chand & Co. Delhi.
5. Raman Meenakshi & Sharma Sangeeta, Technical Communication-Principles & Practice –O.U.P. New Delhi. 2007.
6. Mitra Barum K., Effective Technical Communication – O.U.P. New Delhi. 2006.
7. Better Your English- a Workbook for 1st year Students- Macmillan India, New Delhi.
8. Raymond Murphy, ' Essential English Grammar', Cambridge University Press.

Title: Computer Programming
L-T-P scheme: 3-1-0

Code: CS101
Credit: 4

Prerequisite: There is no prerequisite in this course; however, students having any prior experience of programming are desirable.

Objective:

1. To provide exposure to problem-solving through programming.
2. To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.

Learning Outcomes:

Course Outcome	Description
CO1	Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2	Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3	Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4	Develops the use of the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
CO5	Introduces the more advanced features of the C language

Course Content:

Unit-1: Introduction to Programming: Basic computer organization, operating system, editor, compiler, interpreter, loader, linker, program development. Variable naming, basic function naming, indentation, usage and significance of comments for readability and program maintainability. Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory. Constants, Variables and data Types Character Set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of Variables, assigning values to variables, typedef, and Defining symbolic constants. printf & scanf function.

Unit-2: Operators and Expression: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Special Operators, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Operator precedence and associativity.

Management Input and Output Operators: Introduction, reading a character, writing a character, formatted input, formatted output.

Unit-3: Decision Making Branching: Introduction, Decision making with IF statement, the IF-ELSE statement, nesting of IF-ELSE statement, ELSE-IF ladder, SWITCH statement, ternary operator, and the GOTO statement.

Looping: Introduction, the WHILE statement, the DO statement, The FOR statement, Break and Continue.

Unit-4: Array: Introduction, One-dimensional arrays, Two-dimensional arrays, arrays, Concept of Multidimensional arrays.

Handling of Character strings: Introduction, Declaring and initializing string variables, reading string from terminal, writing string to screen, String, Operations: String Copy, String Compare, String Concatenation and String Length (using predefined functions & without using them), Table of strings.

Unit-5: User-Defined Functions (UDF): Introduction, need for user-defined functions, the form of C function, elements of UDF, return values and their types, Calling a function, category of functions, Nesting of functions, Recursion, Functions with arrays, The scope and Lifetime of variables in functions, multi file program.

Structures and Unions: Introduction, Structure definition, declaring and initializing Structure variables, accessing Structure members, Copying & Comparison of structures, Arrays of structures, Arrays within structures, Structures within Structures, Structures and functions, Unions.

Unit-6: Pointers: Introduction, understanding pointers, Accessing the address of variable, Declaring and initializing pointers, accessing a variable through its pointer, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers & character strings, Pointers & Functions, Function returning multiple values, Pointers and structures.

File Management in C and CONSOLE I/O: Introduction, Defining files and its Operations, Error handling during I/O operations, Random access files, Command line arguments. Types of files, File vs. Console, File structure, File attributes, Standard i/o, Formatted i/o, Sample programs.

Teaching Methodology:

This course is introduced to help students understand the discipline of programming. The programming language used to teach this course is C. Starting from the basic computer architecture, the student will slowly be exposed to program designing and later to programming fundamentals. The entire course is broken down into six separate units, from fundamentals of programming to some complex programming structures like pointers. This theory course is well complemented by a laboratory course under the name Software Development Fundamentals Lab in the same semester that helps a student learn with hand-on experience.

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 and around 20-30% from coverage till Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6 and around 30% from coverage till Test-2

Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

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

Text Book:

- [1] Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill.
- [2] Programming With C, Schaum Series.

Reference Books/Material:

- [1] The 'C' programming language by Kernighan and Ritchie, Prentice Hall
- [2] Computer Programming in 'C' by V. Rajaraman, Prentice Hall
- [3] Programming and Problem Solving by M. Sprankle, Pearson Education
- [4] How to solve it by Computer by R.G. Dromey, Pearson Education

Web References:

- [1] <http://www2.its.strath.ac.uk/courses/c/>

Notes on C programming by University of Strathclyde Computer Centre. This tutorial was awarded the NetGuide Gold Award during the 1990s.

- [2] http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.html

This site contains notes on C programming from Princeton University, USA. These are very useful for students who are learning C as their first programming Language.

- [3] <http://www.stat.cmu.edu/~hseltman/Computer.html>

Online reference material on Computers and Programming from Carnegie Mellon University, Pittsburgh, USA

- [4] <http://projecteuler.net/>

Collection of mathematical problems which make you use your programming skills

Title: Engineering Physics Lab-I
L-T-P scheme: 0-0-2
Learning Outcomes

Code: PH203
Credit: 1

Course Outcome	Description
CO1	Demonstrate ability to collect experimental data and understanding the working procedures within the precautionary limits
CO2	Acquired the ability to analyze the experimental data and related errors in a reflective, iterative and responsive way
CO3	Developed understanding of the basic concepts related to Modern Physics, Basic Solid State Physics and Optics
CO4	Acquired a first hand and independent experience of verifying Kirchoff's circuit laws and related concepts e.g. resistivity, measurement of resistance
CO5	Appreciate the importance of the laboratory work culture and ethics that is intended to impart features like regularity, continuity of self evaluation and honesty of reporting the data

List of Experiments

1. To study the variation of magnetic field along the axis of Helmholtz Galvanometer and to determine its reduction factor.
2. To determine the resistance per unit length of a Carey Foster's bridge and to obtain the specific resistance of a given wire.
3. To determine the wavelengths of spectral lines Red, Green and Violet of mercury using plane transmission grating.
4. To determine the specific rotation of cane sugar solution using Bi-quartz polarimeter.
5. To observe Newton's rings and to determine the wavelength of sodium light.
6. To study the CRO and function generator by producing the following waveforms.
 - i. 10kHz, 8Vp-p(sine wave, square wave, triangular wave)
 - ii. 4kHz, 6Vp-p(sine wave, square wave, triangular wave)
 - iii. 10kHz, 8V_{peak}(sine wave, square wave, triangular wave)
 - iv. 4kHz, 6V_{peak}(sine wave, square wave, triangular wave)
7. To verify the Kirchhoff's current law.
8. To verify the Kirchhoff's voltage law.

Title: Computer Programming Lab
L-T-P scheme: 0-0-4

Code: CS201
Credit: 2

Prerequisite: Experience in programming is desirable.

Objective:

1. To provide exposure to problem-solving through programming.
2. To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
3. To give the student hands-on experience with the concepts.

Learning Outcomes:

Course Outcome	Description
CO1	Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2	Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3	Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4	Develops the use of the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
CO5	Introduces the more advanced features of the C language

Course Content:

The following assignments will be carried out in synchronization with the theory classes.

Unit-1: Introduction to programming Environment (Linux commands, editing tools such as vi editor, sample program entry, compilation and execution). Development of programs using multiple arithmetic and logical operators. Programs for Roots of quadratic equation, conversion of units etc.

Unit-II: Programs using simple control statements such as if else, while, do while etc. Making a program for a calculator for example. Extracting the digits of an integer, reversing digits, finding sum of digits etc.

Unit-III: Programs using For loop, switch statement etc. For example, Finding average of numbers, printing multiplication tables etc. Checking for primes, generation of Armstrong numbers. Generation of the Fibonacci sequence, Finding the square root of a number, calculation of factorials, printing various patterns using for loop. The greatest common divisor of two integers, Raising a number to large power.

Unit-IV: Programs using Arrays: declaring and initializing arrays. Program to do simple operations with arrays. Strings – inputting and outputting strings. Using string functions such as strcat, strlen etc. Writing simple programs for strings without using string functions. Finding the maximum number in a set, Array order reversal, Finding maximum number from an array of numbers Removal of duplicates from an ordered array,

Unit-V: Selection/ Bubble/ Insertion sort, create a linked list, traverse a linked list, insert a node and delete a node form the list. Recursion and related examples such as Tower of Hanoi, computing factorial etc. Practice sessions and sessions for missed labs

Units to Lab Mapping:

Unit	Labs
I	1, 2, 3
II	4, 5
III	6, 7, 8
IV	9, 10, 11
V	12, 13, 14

Teaching Methodology:

This course is introduced to help students understand the discipline of programming. The programming language used to teach this course is C. Starting from the programming environment setup, the student will slowly be exposed to program designing and later to programming fundamentals. The entire course is broken down into six separate units, from fundamentals of programming to some complex programming structures like pointers. This theory course is well complemented by a laboratory course under the name Software Development Fundamentals Lab in the same semester that helps a student learn with hand-on experience.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-13
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

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

Text Book:

1. Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill.
2. Programming With C, Schaum Series.

Reference Books/Material:

1. The 'C' programming language by Kernighan and Ritchie, Prentice Hall

2. Computer Programming in 'C' by V. Rajaraman, Prentice Hall
3. Programming and Problem Solving by M. Sprankle, Pearson Education
4. How to solve it by Computer by R.G. Dromey, Pearson Education

Web References:

1. <http://www2.its.strath.ac.uk/courses/c/>
 - a. Notes on C programming by University of Strathclyde Computer Centre. This tutorial was awarded the NetGuide Gold Award during the 1990s.
2. http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.html
 - a. This site contains notes on C programming from Princeton University, USA. These are very useful for students who are learning C as their first programming Language.
3. <http://www.stat.cmu.edu/~hseltman/Computer.html>
 - a. Online reference material on Computers and Programming from Carnegie Mellon University, Pittsburgh, USA
4. <http://projecteuler.net/>
 - a. Collection of mathematical problems which make you use your programming skills

Title: Workshop Practices

Code: ME201

L-T-P scheme: 0-0-3

Credit: 1.5

Prerequisite: Students must have the knowledge of fundamental principles of Physics and Chemistry up to class 12th which helps them to understand the various processes of Workshop Lab.

Objective:

1. To demonstrate students, the basic manufacturing processes of Workshop lab: Carpentry, Fitting, Welding, Machining and Casting Processes.
2. To develop effective skills in students to identify the manufacturing process with its applications
3. To be able to perform basic manufacturing processes safely.

Learning Outcomes:

Course Outcome	Description
CO1	Identify the various processes of manufacturing.
CO2	Capable to explain the use of various holding, measuring, marking and cutting tools of workshop
CO3	Prepare a useful job by performing the various processes in proper sequence safely
CO4	Apply Bernoulli's theorem to analyze the liquid metal velocity in casting process.
CO5	Develop the skills to join two metallic specimen using welding process
CO6	Work as a team on a project

Course Content:

Carpentry Shop

1. To study about various tools/equipments used in carpentry shop
2. To make Cross lap /T joint as per given specification
3. To make Cross lap /T joint as per given specification

Foundry Shop

1. To study about various tools used in foundry shop.
2. To prepare a green sand mould with the help of a given pattern.
3. To perform permeability test on moulding sand

Machine Shop

1. To study various machine tools such as lathe, milling, shaper, drilling, grinding, EDM drill and cutting tools used by them.
2. To perform turning, step turning and taper turning operations on lathe machine
3. To perform threading operation on the lathe machine

Fitting Shop

1. To study about various tools used in fitting shop.
2. To make a fitting job as per given drawing.

Welding Shop

1. To study various types of welding processes available in the workshop such as Electric arc welding, TIG and MIG welding, gas welding and spot resistance welding,
2. To prepare welding joint by using Electric arc welding/gas welding
3. To prepare welding joint by using Spot Resistance welding

Teaching Methodology:

This Lab course has been introduced to help a student to learn with hand-on experience on machines. The entire course is broken down into fourteen experiments. Experiments are performed different shop wise by taking the proper safety precautions. Workshop lab includes five shops namely: Carpentry, Foundry, Machining, Fitting and Welding. Basic principles of manufacturing processes are applied to prepare a job. Students learn here how to handle the real world problems by using technical skills. The way of experimentation here realizes the students that they are now moving on an Engineering path. This Lab course will enable a student to learn with hand-on experience.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Experiments: 1-7
P-2		15 Marks	Based on Lab Experiments: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

Laboratory Manual available in Lab. Study material of Workshop Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:

- [1] “Workshop Technology Volume- I & II”, B.S. Raghuvanshi, Dhanpat Rai & Co.
- [2] “Workshop Technology Volume-I & II”, Khanna Publisher.

Reference Books:

- [1] “Workshop Technology Vol.- 1, 2, 3 & 4”, Butterworth-Heinemann.
- [2] “Material Science & Engineering”, W. D. Callister, John Wiley

Web References:

- [1] <https://nptel.ac.in/courses/112/107/112107219/>
- [2] <https://nptel.ac.in/courses/112/107/112107144/>

SECOND SEMESTER

Course Description

Course Title: Engineering Mathematics-2

Code: MA103

L-T-P scheme: 3-1-0

Credits: 4

Prerequisite: Students should have basic knowledge of differential equations and calculus.

Objective: This course is aimed

- To introduce the fundamental ideas of the functions of complex variables and developing a clear understanding of fundamental concepts of Complex Analysis.
- To equip students with the concepts of ordinary and partial differential equations and how to solve them with different methods.

Learning Outcomes: This course will enable the students to:

Course Outcome	Description
CO1	Understand the concepts of limit, continuity, differentiability, analyticity, singularities, contour integration, Taylor and Laurent's series expansion of function complex variable.
CO2	Learn various techniques of getting solutions of linear ordinary and partial differential equations of second order,
CO3	Visualize complex numbers as points of $\mathbb{R}^2$, two path test for non-existence of limit, orthogonal trajectories, connected domain, conformal mapping.
CO4	Use Laurent series to evaluate complex integrals and classify the singularities of a function, conformal mapping in modeling and solving boundary value problems, power series method to solve linear differential equations.
CO5	Apply Cauchy residue theorem in evaluation of real integrals and separation of variables method in the solution of heat, wave and Laplace equation
CO6	Formulate mathematical models in the form of ordinary and partial differential equations to problems arising in mechanical, chemical and physical disciplines.

Course Content:

Unit-1: Functions of complex variable, analytical functions and Cauchy-Riemann equations, Conformal mapping, Poles and singularities, complex integration, Taylor's and Laurent's series, Cauchy residue theorem, contour integration and their application.

Unit-2: Second order linear differential equations, Convergence of series, convergence tests, solution of D.E. in series, Bessel functions; Legendre and Chebyshev polynomials, Orthogonality.

Unit-3: Second order partial differential equations and classification, one dimensional wave and diffusion equations with their applications. Laplace and Poisson equations. Use of Green's function.

Methodology:

The course will be covered through lectures supported by tutorials. Apart from the discussions on the topics covered in the lectures, assignments and quizzes in the form of questions will also be given for practice.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Syllabus covered upto Test-1
Test-2	25 Marks	Syllabus covered upto Test-2
Test-3	35 Marks	Full Syllabus
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Tutorials, lecture slides and books on mathematics-2 will be available on the JUET server.

Books

1. Kreyszig, Erwin : Advanced Engineering Mathematics, John Wiley & Sons, Inc.
2. Simmons, G.F. : Differential Equations with Applications, 2nd Ed., McGrawHill, 1991.
3. Brown, J.W., Churchill, R.V. : Complex Variables and Applications, 6th Ed., McGrawHill, 1996.
4. Prasad, C : a) Mathematics for Engineers
b) Advanced Mathematics for Engineers, Prasad Mudranalaya, 1982.
5. Grewal, B. S. : Higher Engineering Mathematics, Khanna Publishers Delhi.

Title: Engineering Chemistry

L-T-P Scheme: 3-1-0

Code: CH103

Credit: 4

Prerequisite: The students must be aware of basic Chemistry upto class 12th. Basic knowledge of chemistry helps them to correlate in various division of Engineering during this course.

Objective:

The purpose behind this course is to make the students familiar with the concepts of the Chemistry and to understand the significance of Chemistry in various field of the Engineering (Chemical, Mechanical and Civil Engineering).

Course Learning Outcomes:

Course Outcome	Description
CO1	The outline, outcomes and attributes provide students with learning experiences that help in still deep interests in learning chemistry; develop broad and balanced knowledge and understanding of key chemical concepts, principles, and theories related to chemistry; and equip students with appropriate tools of analysis to tackle issues and problems in the field of chemistry.
CO2	Describe the real world problems, challenges with application of the Chemistry in various fields of engineering (Chemical, Mechanical and Civil Engineering).
CO3	Develop in students the ability to apply the knowledge and skills they have acquired to the solution of specific theoretical and applied problems in chemistry.
CO4	Identify and use of various analytical techniques in the Chemical, Mechanical and Civil Engineering project management.
CO5	Apply experimental demonstration and validation by using various analytical techniques given in theorem, principles as explained in lectures.
CO6	Demonstrate students with the knowledge and skill base that would enable them to undertake further studies in chemistry and related areas or in multidisciplinary areas that involve chemistry and help develop a range of generic skills that are relevant to wage employment, self-employment and entrepreneurship.

COURSE CONTENT

Unit 1: Alloys

Purpose of making alloys; Types of alloys; Alloy steels; Light alloys; Cast alloys; Copper alloys; Nickel alloys; Nickel iron alloys; Nickel chromium alloys; Super alloys; Lead alloys; Bearing alloys; Modes of formation of alloys; Preparation of alloys; Treatment of alloys.

Unit 2: Corrosion

Types of corrosion; Dry and wet corrosion; Chemical corrosion; Factors promoting corrosion; Galvanic corrosion; Atmospheric corrosion; Open air corrosion; Water corrosion; Pitting corrosion; Inter granular corrosion; Waterline corrosion; Corrosion fatigue; Prevention of corrosion.

Unit 3 : Protective / Metallic Coatings

Coating processes; Hot dipping; Metal cladding; Electroplating; Displacement or immersion plating; Cementation; Metal spraying or metalized coatings; Organic coating.

Unit 4: Adhesives

Introduction; Classification & preparation of adhesives; Animal glue; other protein adhesives; Starch adhesive; Synthetic resin adhesives; Rubber based adhesives; Cellulose and silicate adhesives; Uses of adhesives.

Unit 5: Paints and Pigments

White pigments; white lead; Characteristics of pigments; Zinc oxide; Physical properties of pigments; Characteristics of pigments; Blue pigments; Ultramarine blue; Cobalt blue and iron blue; Red pigments; Red lead; Yellow pigments; Paints; Distempers; Manufacture; Emulsion paint; Varnishes; Lacquers.

Unit 6: Lubricants

Properties of lubricants; Classification of lubricants; Substances used as lubricants; Additives for lubricating oil; Lubricants of mineral origin; Synthetic lubricants; Lubricating greases; Chemical properties of greases; Selection of lubricants.

Teaching Methodology:

This course comprises 3 lectures and 1 tutorial per week. The course content is divided into 42 lectures and 14 tutorials. The lectures will be conducted in both, white board and PowerPoint presentation, modes. At the end of this course student will be able to understand the significance of the basic Chemistry in various field of engineering such as paints, lubricants, adhesives etc.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and Unit-2
Test-2	25 Marks	Based on Unit-3 & Unit-4 (70 %) 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-1 and Text-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

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

Text Book:

- [1] P.C Jain & M. Jain 'Engineering Chemistry'. Dhanpat Rai & Co.(pvt.) Ltd.
- [2] Puri Sharma & Pathania "Physical Chemistry" Vishal Publishing Co. 2002
- [3] Puri Sharma & Pathania "Inorganic Chemistry" Vishal Publishing Co. 2002

Reference Book:

- [1] Shashi Chawala 'Theory and Practical of Engineering Chemistry'. Dhanpat Rai & co.(pvt.) Ltd.
- [2] S.S. Dara "A Text book of Engineering Chemistry". S.Chand & Company Ltd. 2008

Title: Applied Mechanics
L-T-P scheme: 3-0-0

Code: CE102
Credits: 3

Prerequisite: Not Applicable

Objective:

To learn to use the knowledge of mechanics in understanding the behavior of structures. This course serves as an introduction to structural systems, and to methods of analyzing these systems under various loading conditions.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various system of forces and concepts of resultant force in structural members.
CO2	Identify the types of forces acting in structures
CO3	Analyze planar the forces in members of trusses, frames and problems related to friction
CO4	Describe the motion characteristics of a body subjected to a given force system
CO5	Determine the centroid and second moment of area of structural elements.
CO6	Apply the verification and validation techniques developed to real life problems of mechanics

Course Content:

Unit-1: Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces. Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility

Unit-2: Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

Unit-3: Analysis of pin jointed frames, method of joints, sections and tension coefficient, Graphical method, Friction and its application. Kinematics of particle and rigid body, Dynamics of particle and rigid body, Virtual work, Impulse and Momentum

Unit-4: Centroids and centre of mass– Centroids of lines and areas, Theorems of Pappus - Area moments of inertia of plane areas by integration, Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia – mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia

Unit-5: Introduction, Equations of motion for single degree of freedom system, free and forced vibrations and damped vibrations.

Unit-6:Compound springs with linear motion

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, & 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 Applied Mechanics (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Beer, F.P and Johnston Jr. E.R., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, “Engineering Mechanics”, Oxford University Press (2010)

Reference Books:

1. Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4 th Edition, Pearson Education (2006)

Title: Electrical Circuit Analysis

Code: EC102

L-T-P scheme: 3-1-0

Credit: 4

Prerequisite: Not Applicable

Objective:

1. To learn the basic concepts of electrical engineering.
2. To analyze the various electrical circuit with the help of practical.

Learning Outcomes:

Course Outcome	Description
CO1	Be aware of basic essentials of electrical circuit
CO2	Apply theorems for finding the solutions of network problems
CO3	Analysis the behavior of direct current transients
CO4	Realize the performance of two port network parameters
CO5	Be familiar with the role of alternating current in home and industry
CO6	Evaluate the performance of various alternating current circuits

Course Content:

Unit I: Basic Electrical Circuit: Electromotive Force , Terminal Voltage; Resistance (R), Inductance (L) and Capacitance (C) from (i) Circuit, (ii) Energy, and (iii) Geometrical Points of View; Voltage Divider, Current Divider; Star-Delta Transformation; Voltage Source and Current Source, Source Transformation, Combination of Sources; Controlled (Dependent) Sources.

Unit II: Network Analysis and Network Theorems: Kichhoff's Circuit Law (KCL), Kichhoff's Voltage Law (KVL), Loop-Current Analysis, Mesh Analysis, Node-Voltage Analysis, Choices of Method of Analysis. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Millman's Theorem, Reciprocity Theorem.

Unit III: DC Transients: Simple RL Circuit, Time Constant, Decay and Growth of Current; Simple RC Circuit, Discharging of a Capacitor, Charging of a Capacitor.

Unit IV: Two Port Networks: Impedance parameters, Admittance parameters, Hybrid parameters, Equivalent circuits of all the parameters, Symmetry and Reciprocity conditions.

Unit V: Alternating Voltage and Current: Physical Model for a Sinusoid, Phase and Phase Difference; Average Value, Effective Value, Form Factor and Peak Factor; Concept of Phasors, Addition of Phasors Using Complex Numbers; Non sinusoidal Waveforms; Power and Power Factor; Behaviour of R , L and C in AC Circuits.

Unit VI: AC Circuits: Series RL Circuit, Complex Impedance; Series RC Circuit, Complex Power; Parallel RL Circuit; Parallel RC Circuit; Series RLC Circuit and its Phasor Diagram; Parallel RLC Circuit and its Phasor Diagram, Q factor, Resonance in series parallel RLC circuits.

Teaching Methodology:

This course is introduced to help students for understanding the basic concept of electrical engineering. Initially an overview of basic terminology of electrical circuit along with various component needed for circuits will be discussed briefly. In the first part, Direct Current (DC) related issues are elaborated through various theorems. Later on DC transient is evaluated on various circuits. In the second part, Alternating Current (AC) is described by different parameters and phasor diagrams. At the end, ac circuits and resonance condition has been evaluated.

Evaluation Scheme:

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

Learning Resources:

Tutorials and lecture slides on theory course will be added from time to time and a digital copy of study material will be available on the JUET server.

Text Books:

- [1] “Basic Electrical Engineering”, D.C. Kulshreshtha, McGraw Hill Education, 2009.
- [2] “Engineering Circuit Analysis”, W.H. Hayt, J. E. Kemerly and S.M. Durbin, 6th edition, McGraw Hill, 2006.
- [3] “Introduction to Electric Circuits”, R.C. Dorf & J.A. Svoboda, John Wiley, 2004.

Reference Books:

1. “Network Analysis”, V. Valkenburg, Prentice-Hall India Ltd., 2001.
2. “Basic Electrical Engineering”, A. Chakrabarti, S. Nath, C. K.Chanda, Tata McGraw Hill Publishing Co, 2008.
3. “Principles of Electrical Engineering”, V. D. Toro, Prentice Hall of India.

Web References:

- [1] <https://www.rapidtables.com/electric/index.html>
- [2] <https://library.automationdirect.com/basic-electrical-theory/>

Journals References:

- [1] International Journal of Circuit Theory and Application Wiley publication
- [2] [International Journal of Circuits and Electronics](#)

Title: Engineering Chemistry Lab
L-T-P scheme: 0-0-2

Code: CH202
Credit: 1

Prerequisite: The students must be aware of basic Chemistry Experiment upto class 12th. Basic knowledge of chemistry helps them to correlate in various division of Engineering during this lab.

Objective:

The purpose behind this course is to make the students familiar with the concepts of the Chemistry Experiment and to understand the significance of Chemistry in various field of the Engineering (Chemical, Mechanical and Civil Engineering).

Course Learning Outcomes:

Course Outcome	Description
CO1	The outline, outcomes and attributes provide students with learning experiences that help in still deep interests in learning chemistry; develop broad and balanced knowledge and understanding of key chemical concepts, principles, and theories related to chemistry; and equip students with appropriate tools of analysis to tackle issues and problems in the field of chemistry.
CO2	Describe the real world problems, challenges with application of the Chemistry in various fields of engineering (Chemical, Mechanical and Civil Engineering).
CO3	Develop in students the ability to apply the knowledge and skills they have acquired to the solution of specific theoretical and applied problems in chemistry.
CO4	Identify and use of various analytical techniques in the Chemical, Mechanical and Civil Engineering project management.
CO5	Apply experimental demonstration and validation by using various analytical techniques given in theorem, principles as explained in lectures.
CO6	Demonstrate students with the knowledge and skill base that would enable them to undertake further studies in chemistry and related areas or in multidisciplinary areas that involve chemistry and help develop a range of generic skills that are relevant to wage employment, self-employment and entrepreneurship.

LIST OF EXPERIMENT

1. To determine the dissolve oxygen (DO) in the given water samples.
2. To determine the pH and conductivity of the given water samples.
3. To determine the relative viscosity of given unknown liquids.
4. To determine the relative surface tension of the given unknown liquid.
5. To determine the equivalence point by using pH metric titration of strong acid and weak base.
6. To determine the alkalinity of a given water sample.
7. Determination of total hardness of water by complexmetric titration using EDTA.
8. To find out the strength of unknown solution of oxalic acid & sodium hydroxide with the help of N/20 oxalic acid solution by double titration.
9. Confirmation of hetro-elements e.g. N, S, Cl, Br and I by Lassaigne's test.
10. Detection of functional groups e.g. aldehyde, alcohol, carboxylic and ketone in the given organic compound.

11. To prepare urea formaldehyde resin by condensation reaction. (Bakelite).
12. Evaluation of physical properties of oils e.g. saponification value and acid value.
13. Separation of pigments/colored ions by paper/column chromatography.
14. Separation of parameter by using TLC.

Teaching Methodology:

This course planned in 14 lab experiment and each experiment having 2 hours practical exposure in Chemistry lab. Their continuous evaluation will be performed in each week and weightage given during finalizing of the grade sheet. At the end of this course student will be able to: Understand the significance of the basic Chemistry in various field of engineering.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 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 Book

1. Organic Chemistry Lab Technique, Lisa Nichols Publisher, by Lisa Nichols, Butte Community College.
2. Practical Chemistry Labs, by Leonard Saland, Manufacturer: Walch Education 015116

Reference Book

1. Green Chemistry, by Sally A. Henrie, CRC Press Published March 18, 2015.
2. Drinking Water Chemistry: A Laboratory Manual by Barbara Hauser, CRC Press Published August 21, 2001.

Title: Applied Mechanics Lab

Code: CE201

L-T-P scheme:0-0-2

Credit: 1

Prerequisite: Engineering Mechanics

Objective: To develop knowledge of different types of forces and their application

Learning Outcomes:

Course Outcome	Description
CO1	Define basic concepts of applied mechanics.
CO2	Illustrate the equilibrium of forces in structures.
CO3	Apply the concepts of equilibrium of structures to solve common problems.
CO4	Describe the static and dynamic equilibrium of forces in structural elements.
CO5	Analyze the various concepts developed in applied mechanics for their suitability to solve a given problem.
CO6	Demonstrate the structural equilibrium in real life problems.

Course Content:

List of Experiments:

1. To find the Law of triangular of forces by gravensand's Apparatus.
2. To find the law of parallelogram of forces by gravensand's Apparatus
3. To verify the law of polygon of forces by gravensand's Apparatus
4. To verify Lami's theorem by Jib crane apparatus.
5. To find the forces in Jib crane apparatus.
6. To find coefficient of friction between two surfaces on a horizontal surface.
7. To find coefficient of friction between two surfaces on a inclined plane.
8. To verify support reaction by parallelogram force apparatus.
9. To find the forces in a member of a triangular truss.
10. To find the resultant of forces graphically

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
P-1		15 Marks	Based on Lab Exercises: 1-5
P-2		15 Marks	Based on Lab Exercises: 5-10
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 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. Beer, F.P and Johnston Jr. E.R., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, “Engineering Mechanics”, Oxford University Press (2010)

Reference Books:

1. Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education (2010).
2. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons,(1993)

Title: Engineering Drawing & Design Lab
L-T-P scheme: 0-0-1

Code: ME203
Credits: 1.5

OBJECTIVE

- [1] Enables students to learn the concepts of graphic communication, their role in sanitary construction.
- [2] Make familiar with different drawing equipment, technical standards and procedures for construction of geometric figures.
- [3] Equipped with the skill that enables them to convert pictorial to orthogonal representations.

Course Outcome	Description
CO1	Outline the objectives of scale and develop the imagination and mental visualization capabilities for correlating the geometrical details of objects.
CO2	To develop the constructional ability for a different curve.
CO3	To Describe BIS rules for orthogonal projection and understand the fundamental concept of orthogonal projection for point, line, plane and solids.
CO4	Understand and apply orthogonal projection for solids, section and intersection of solid objects/structures
CO5	To apply the skill of development of surfaces of three dimensional objects for evaluation of black size of the components.
CO6	Demonstrate computer aided drafting tools and techniques using CAD software's

Course Content:

Unit-1: Study and construction of lines, lettering, dimensioning, plane scales, diagonal scales, construction of different methods used for the construction of conic curves.

Unit-2: Study and construction of geometrical construction, cycloidal curves, involutes and helix etc.

Unit-3: Orthogonal projection of point in all possible positions, Study and construction of projection of line and its applications (inclined to both planes), and projection of planes (inclined to both planes).

Unit-4: Study and construction of projection of solids (right circular cone, prism, pyramid and cylinders), and true shape of sections,

Unit-5: Study and construction of oblique projection and development of surface, isometric view using orthogonal projection on isometric scales.

Unit-6: Introduction to basic and editing command of CAD software, 2-D drafting, surface modeling, and 3-D geometrical model.

Teaching Methodology:

This course is introduced to build the imagination and established the correlation between the real object and engineering drawing and CAD developed by the design engineers and the requirement of the production engineers of the different units.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

The study material of engineering drawing & design lab (will be added time to time): Digital copy will be available on the JUET server.

Text Book:

1. Bhatt, N.D., Engineering Drawing,

Reference Books:

2. Gill, PS, A Text Book of Engineering Drawing (Geometrical Drawing)
3. Dhananjay A J, Engineering Drawing with an introduction to Auto CAD, Mc Graw Hill

Title: Electrical Circuit Analysis lab
L-T-P scheme: 0-0-2

Code: EC206
Credit: 1

Prerequisite: Not applicable

Objective:

3. To analyze the various dc network theorem.
4. To learn the ac fundamental concepts.

Learning Outcomes: In reference to Electrical Circuit Analysis (18B11EC212), the students will be able to:

Course Outcome	Description
CO1	Be aware of basic laws of electrical circuit
CO2	Apply theorems for finding the solutions of network problems
CO3	Calculate the power from electrical circuits
CO4	Analysis the behavior of direct current transients
CO5	Realize the performance of two port network parameters
CO6	Evaluate the performance of various alternating current circuits

Course Content:

Unit-1; Lab exercises based on basic law's of electrical circuits

Unit-2; Lab exercises based on various dc theorems such as superposition, Thevenin's

Unit-3; Lab exercises based on power calculation with the help of maximum power transfer

Unit-4; Lab exercises based on transient analysis of electrical circuits

Unit-5; Lab exercises based on different two-port network

Unit-6; Lab exercises based on ac fundamental circuits

Teaching Methodology:

This lab course is introduced to help students for understanding the basic concept of electrical engineering. Initially an overview of basic terminology of electrical circuit along with various component needed for circuits will be discussed briefly. In the first part, Direct Current (DC) related issued are elaborated through various theorems. Later on DC transient is evaluated on various circuits. In the second part, Alternating Current (AC) is described by different parameters and phasor diagrams. At the end, ac circuits and resonance condition has been evaluated.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Lab Exercises: 1-7
P-2	15 Marks	Based on Lab Exercises: 8-14

Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

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

Text Books:

- [4] “Basic Electrical Engineering”, D.C. Kulshreshtha, McGraw Hill Education, 2009.
- [5] “Engineering Circuit Analysis”, W.H. Hayt, J. E. Kemerlay and S.M. Durbin, 6th edition, McGraw Hill, 2006.
- [6] “Introduction to Electric Circuits”, R.C. Dorf & J.A. Svoboda, John Wiley, 2004.

Reference Books:

- 4. “Network Analysis”, V. Valkenburg, Prentice-Hall India Ltd., 2001.
- 5. “Basic Electrical Engineering”, A. Chakrabarti, S. Nath, C. K.Chanda, Tata McGraw Hill Publishing Co, 2008.
- 6. “Principles of Electrical Engineering”, V. D. Toro, Prentice Hall of India.

Web References:

- [3] <https://www.rapidtables.com/electric/index.html>
- [4] <https://library.automationdirect.com/basic-electrical-theory/>

Journals References:

- [3] International Journal of Circuit Theory and Application Wiley publication
- [4] [International Journal of Circuits and Electronics](#)

THIRD SEMESTER

Course Description

Course Name: Managerial Economics

L-T-P scheme: 2-1-0

Course Code: HS102

Credit: 3

Scope and Objectives:

Managerial Economics is concerned with the application of economic principles and methodologies to key management decisions within organizations. It provides principles to foster the goals of the organization, as well as a better understanding of the external business environment in which an organization operates. Managerial Economics is fundamentally a unique way of thinking about problems, issues and decisions that managers face in each of the functional areas of the organization as well as the strategic ones faced by general managers.

Learning Outcomes:

After successful completion of course, students should be able to:

Course Outcome	Description
CO1	Outline what managerial economics is and how micro and macro economics differ from each other.
CO2	Describe basic concepts & elasticities of demand.
CO3	Develop an understanding of factors of production.
CO4	Identify different types of cost.
CO5	Apply logic to understand different market structures viz Perfect Competition; Monopoly; Monopolistic Competition; and Oligopoly.
CO6	Deploy and be proficient in contribution and break even analysis

Course Description:

Unit 1 : Introduction to Managerial Economics & Macro-economic Concepts

Definition of Economics, Meaning & Scope of Managerial Economics, Micro & Macro Economics concepts – National income, GDP, Inflation, Monetary Policy, Fiscal Policy, SLR, CRR, Concept of economic profit, Opportunity Cost, Discounting principle, time value of money, Equi marginal utility

Unit-2 : Demand Analysis

Law of demand, Individual & market demand, Determinants of market demand, Marginal Utility theory, Elasticity of demand – Price, Income, Cross, Advertising, Theory of Consumer choice using Indifference Curve analysis, Demand forecasting techniques – Delphi, Survey, Time series analysis, Correlation, Regression

Unit-3 : Production Theory and Analysis

Production with one variable, optimal employment of a factor of production, Cobb Douglas production function, Production with two variable inputs, Production Isoquants, Production Isocosts, Optimal employment of two inputs, the expansion path, Basics of Supply, Market Equilibrium

Unit-4 : Cost Theory and Analysis

Cost concepts – Opportunity, Explicit, Marginal, Incremental and Sunk, Relation between Production & Cost, Short run cost function, Long run cost function, Special topics -Profit contribution analysis, Break Even analysis

Unit-5 : Pricing under Different Market Structures

Perfect Competition - Determination of Price output relationship in short run, long run, Monopoly - Determination of Price output relationship in short run & long run , Price discrimination , Monopolistic Competition - Determination of Price output relationship in short run & long run , Product Differentiation ,Oligopoly -Types ,Determination of Price output relationship ,Kinky demand curve {Stickiness of Price},Price leadership model, Collusive and Non Collusive Oligopoly

Evaluation Scheme:

Test-1	15 Marks
Test-2	25 Marks
Test-3	35 Marks
Assignment -1	5 marks
Assignment-2	5 marks
Quiz	5 marks
Presentations	5 marks
Attendance	5 marks
Total	100 marks

Text Books:

1. Managerial Economics by Arun Kumar, Rachana Sharma
2. Managerial Economics by P.L.Mehta
3. Managerial Economics, 5Th Ed by William F.Samuelson, Stephen G. Marks
4. Managerial Economics: Concepts and Principles by Donald N. Stengel
5. Managerial Economics, 7E ,by D N Dwivedi

Course Description

Title: Mechanics of Solids
L-T-P scheme: 3-1-0

Code: CE103
Credits: 4

Prerequisite: Applied mechanics

Objective: To develop knowledge of mechanics related to solids.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the concept of stress and strain and strains in members and the relation between elastic constants.
CO2	Develop the concept of shear force and bending moment diagrams, shear and bending stresses in beams.
CO3	Describe the theories of elastic failure and graphically compare them.
CO4	Identify slopes and deflection in structural elements and use the governing equation for deflection to solve the problems by different methods.
CO5	Analyze the plane stress and plane strain in structural elements using Mohr's stress circle and strain measurements and strain rosettes.
CO6	Apply the theoretical concepts to solve the problems

Course Content:

Unit-1: Simple stresses and strains: Stress-strain relationships, elastic constants and their relationships, temperature stresses. Analysis of axially loaded members: Bars of uniform, varying and tapering cross sections, composite bars..

Unit-2: Complex Stresses: Stresses on inclined planes, principal stresses and strains, Mohr's circle of stresses, theories of elastic failure

Unit-3: Simple theory of bending, bending and shear stress distributions in beams

Unit-4: Bending moment and shear force diagrams, relationships between loads, shear force and bending moment. Slope and deflection of beams: Differential equation of the deflection curve

Unit-5: Double Integration Method, Macaulay's Method, and Moment Area Method and Conjugate Beam Method.

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 Mechanics of Solids (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Ramamrutham, S., and R. Narayan. Strength of materials. Dhanpat Rai Pub Company, 2008.
2. Analysis of Structures by Vazirani&Ratwani, Khanna Publishers Delhi
3. Punmia, B. C. Mechanics of materials. Firewall Media, 2002.

Reference Books:

1. Solid Mechanics, 1st revised edition. by: S. M. A. Kazimi, Tata McGraw Hill, New Delhi, 1988.
2. Introduction to Mechanics of Solids, by: E. P. Popoo, Prentice Hill of India, New Delhi, 1973.
3. Mechanics of Solids: An Introduction, by: S. H. Crandall, N.C. Dahl and T.V. Lardner, McGraw Hill International, Tokyo, 1994.
5. Mechanics of Materials by Gere and Timoshenko, CBS Publishers New Delhi.

Course Description

Title: Mechanics of Fluid
L-T-P scheme: 3-0-0

Code: CE105
Credits: 3

Prerequisite: Nil

Objective:

1. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
2. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the fundamental principle of mechanics of fluid.
CO2	Describe the static, kinematics and dynamics of flow.
CO3	Develop the concept of boundary layer and pipe flow.
CO4	Identify the types of flow and flow measurements.
CO5	Apply principles of dimensional analysis to various fluid flow phenomena.
CO6	Design the branched pipe systems.

Course Content:

Unit-1: Introduction; Definition, Types of fluid, Properties of fluid, Fluid pressure on curved & plane surfaces, Pressure measurement, Stability of floating bodies.

Unit-2: Kinematics of fluid flow; steady & unsteady, uniform & non-uniform, rotational & irrotational, laminar & turbulent flow, Continuity equations for 1-D & 2-D flows, Flow-nets.

Unit-3: Dynamics of fluid flow; Euler's equation, Bernoulli's equation, Venturimeter, Pitot-tube, Orifice-meter, Notches & Weirs, Mouthpieces, Impulse-momentum equation, Dimensional analysis & modelling criteria.

Unit-4: Boundary Layer Theory; Elements of boundary layer theory, Drag & lift Airfoil theory.

Unit-5: Analysis of pipe flow; Laminar & Turbulent flow through pipes & velocity distribution, Darcy-Weisbach's equation, Losses in pipe sections, branching of pipes.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and Unit-2
Test-2	25 Marks	Based on Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 and 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Fluid Mechanics including Hydraulic Machines, A. K. Jain, Khanna Publishers
2. A Textbook of Fluid Mechanics and Hydraulic Machines, Modi & Seth, Standard Book House, New Delhi.
3. Fluid Mechanics and Hydraulics Machines, R. K. Bansal, Laxmi Publication, New Delhi.

Reference Books:

1. Fluid Mechanics, Fluid Machines & Hydraulics by Gupta & Alam Singh, CBS Publishers & Distributors, New Delhi.
2. Fluid mechanics through problems by Garde, New Age International Publication, New Delhi.
3. Open channel hydraulics, K. Subramanya, Tata McGraw-Hill, New Delhi.

Course Description

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

Code: CE104
Credits: 3

Prerequisite: Nil

Objectives:

1. To learn the fundamentals of soil and to implement them in design.
2. To develop a computer based system for fast and efficient design of soil structure.

Learning Outcomes:

Course Outcome	Description
CO1	Outline Soil classification and Index properties of Soil.
CO2	Describe the characterization of the soil
CO3	Develop the concepts of soil behaviour under loading.
CO4	Identify the various types of soil failure static loading.
CO5	Apply the concepts of compressibility, earth pressure and stability of slopes.
CO6	Demonstrate the shear strength, settlements and lateral pressure of soil.

Course Content:

Unit-1: Introduction to Geo-technical problems in Civil Engineering, complexity of soil nature

Unit-2: Soil types and formation, regional soil deposit of India; Solids-water-air relationships and index properties of soils.

Unit-3: Soil identification and B.I.S. classification; Flow through soils.

Unit-4: Permeability, capillarity, design of protective filters and principle of effective stresses.

Unit-5: Soil compaction and field control.

Unit-6: Stress distribution in soil due to applied surface loads.

Unit-7: Compressibility and one dimensional consolidation characteristics of soils.

Unit-8: Shear strength of soil; Earth pressure theories for retaining walls, Stability of Slopes.

Teaching Methodology:

In the end of the course the student will be able to classify the soils, analyze the flow of water through soils, to estimate the stress distribution in the soil mass and compaction characteristics, compressibility characteristics, settlements and to assess the shear strength of the soils. Also, the students will be able to estimate the earth pressures on the retaining walls and analyze the stability of slopes.

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 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-8 and around 30% from coverage of Test-2
Assignment	10 Marks	25 Marks
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

TEXT BOOKS:

1. Geotechnical Engineering by C. Venkatramaiah, New Age International Private Limited; Fifth edition (2017)
2. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher Dist. (2020)
3. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering, by V. N. S. Murthy, Crc Press (2010)
4. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New Age International Pvt Ltd; Third edition (2016)

REFERENCE BOOKS:

1. Geotechnical Engineering by Sahashi K. Gulhati, Manoj Datta, McGraw Hill Education (2017)
2. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri, John Wiley & Sons Inc; 3rd edition (1996)
3. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning (2002)
4. Soil Mechanics by T. William Lambe and Robert V. Whitman, Wiley India Pvt Ltd (2012).

Course Description

Title: Surveying
L-T-P scheme:3-0-0

Code: CE107
Credits: 3

Prerequisite:

Objective:

To learn the fundamentals of different types of surveys, and their applications in the field of civil engineering.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the principle of various methods of surveying.
CO2	Identify the suitable surveying technique for a given field problem.
CO3	Analyze the data collection methods and prepare field notes.
CO4	Describe the principle of working of survey instruments.
CO5	Determine the errors and plot the data to scale.
CO6	Apply the concepts of surveying to interpret the data and compute areas and volumes

Course Content:

Unit-1: Introduction: Classification of surveying, Principle of surveying. Error due to use of wrong scale. Instruments for chaining, Errors due to incorrect chain

Chain Surveying: Chaining on sloping ground, Errors in chaining, Tape corrections, Chain triangulation, setting out right angles, Basic problems in chaining, Conventional symbols used in chaining

Unit-2: Compass Surveying: Instruments (Prismatic & Surveyor compass), Bearing and angles, Magnetic declination, Local attractions, errors in compass survey

Plane Table Surveying: Instruments, Principle & methods of plane tabling, Three-point problem, two point problem, Errors in plane tabling, Advantages & disadvantages

Tachometric Surveying: Instruments and Tachometric methods

Leveling: Instruments, Optical defects in lenses, Temporary adjustment of a level, Direct leveling, Differential leveling, Reciprocal leveling, Curvature & Refraction corrections, Leveling problems, Errors in leveling, the level tube, trigonometrical leveling

Unit-3: Contouring: Contours, Contour interval, Contour gradient, Characteristics of contours, Methods of locating contours & their interpretation, Uses of contour maps, Calculation of areas& volumes, Planimeter, minor instruments

Theodolite: Transit & Non-transit, Definition & terms, Measurement of horizontal & vertical angles, Fundamental lines of the theodolite and desired relationships, Sources of error. Traverse Surveying: Methods of traversing, Traverse computations, closing errors, Balancing the traverse, Omitted measurements

Unit-4: Photographic Surveying: Principles, Aerial photography. Aerial Camera, Scale of Vertical Photograph, Computation of Length of Line between Points of Different Elevations, Relief Displacement, Flight Planning for Aerial Photography

Unit-5: Introduction to Remote Sensing, Idealized Remote Sensing, Basic Principles of Remote Sensing

Unit-6: Special instruments: Telemeter, Altimeter, Electronic Theodolites, The Geodimeter, The Tellurometer, Total Station. Introduction to Drone Survey

Unit-7:Curves: Simple circular, Compound, Reverse & Transition curves, setting out of the curves

Photographic Surveying: Principles, Advantages of Aerial photography

Setting Out Works: Buildings, Culverts, Bridges, Tunnels, Transferring levels underground. Introduction to Remote Sensing, GPS, GIS and Map study

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, Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-7 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 Surveying (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. Plane Surveying by A.M.Chandra (New Age International Publishers, New Delhi
2. Surveying-1, Surveying-2, by B.C.Punmia, Laxmi Publication Delhi.
3. Surveying & Leveling by N.N.Basak, Tata McGraw Hill Publishing Com. New Delhi.

Reference Books:

1. Higher Surveying by A.M.Chandra, New Age International Publishers New Delhi.
2. Plane Surveying vol-1 & vol-2 by Clark David, CBS Publishers, Delhi.
3. Surveying-3 by B.C.Punia, Laxmi Publication Delhi

Course Description

Title: Building Materials & Construction
L-T-P scheme: 3-0-0

Code: CE108
Credits: 3

Prerequisite: Not Applicable

Objective:

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

Learning Outcomes:

Course Outcome	Description
CO1	Outline the various available conventional and newer construction materials and techniques.
CO2	Develop the concept of selection of suitable material for various structural elements.
CO3	Describe the pros and cons of different materials and techniques.
CO4	Identify the suitability of material and technique in various real life problems
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: Building Materials: Classification, Properties and selection criteria of Bricks Burning of Bricks, tests for bricks, stone Classification, characteristics of good building stone, common building stones in India

Unit-2: lime, timber, Characteristics of good timber, defects in timber, seasoning of timber, tests on timber, plywood, cement, concrete, steel, glass, plastics, P.V.C.Paint, Varnish, Adhesive material, Bitumen, Composite Material, Ceramics, Material from industrial wastes.

Unit-3: Modern Building Materials: Composite Material, Ceramics, Phospogypsum panels, bamboo mat board, Red mud polymer jute composites, Dry Wall Panel System.

Unit-4: Building Construction: Classification of buildings, Brick masonry, stone masonry, Types of walls, partition and cavity walls Pre-fabricated construction. Plastering and pointing. Types of roofs and roof covering, treatment for water proofing, Types of floors, foundations. Damp proofing materials and techniques, Anti-termite treatment, Doors and windows: sizes and locations, proportions, Concrete repair, Formwork designing. Modern curing techniques, Introduction to Building Information Model (BIM), Detailing of electrical and plumbing facilities. GRAHA Rating

Unit-5: Stair and staircases, Lifts and escalators, White washing, colour washing, painting, distempering, Shuttering, scaffolding and centering. Expansion and construction joints, Sound and fire proof construction, Recommendation of NBC and Building by laws. Construction methods: Precast Flat Panel System, 3d Volumetric Construction, Precast Foundations .Fabrication Of Pre Cast Components

Unit 6: Biomaterials: Bamboo, Straw Bale, Bio Cementing, Plant-based Natural Fibers, Durability of Bio-Based Building Materials, Building Information Modelling (BIM)

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-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 Building Materials & Construction (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. ‘A Text Book of Building Construction’ by Arora, S.P. & Bindra, S.P., Dhanpat Rai & Sons, Delhi.
2. “Building Construction”, by Jha, J. & Sinha, S.K., Khanna Publishers, Delhi
3. “A Text Book of Engineering Materials”, by Kulkarni, C. J., Ahmedabad Book Depot, Ahmedabad, 1968.

Reference Books:

1. "Building Construction, by McKay W.B., "Vol.1 to 4, Orient Longman Ltd.
2. "A Text Book of Building Construction" by Punmia, B.C., Laxmi Publications, Delhi
3. "Engineering Materials", by Singh Surendra, Konark Publishers Pvt. Ltd. 1994.

Course Description

Title: Building Material Lab
L-T-P scheme: 0-0-2

Code: CE208
Credit: 1

Prerequisite: Not Applicable

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

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic properties of building materials.
CO2	Describe the standard testing procedures for building materials.
CO3	Develop the concepts for understanding the physical and mechanical properties of materials.
CO4	Identify the significance of different tests and their influence on structural behavior.
CO5	Apply the fundamentals of testing methods to different materials.
CO6	Design the concrete mixes for required properties.

Course Content:

List of Experiments:

1. Determination of water absorption and efflorescence of brick.
2. Determination of compressive strength of brick.
3. To determine the quantity of water for cement paste for normal consistency, initial and final setting time of cement
4. To determine the fineness, specific gravity and unit weight of cement
5. To determine fineness modulus of fine and coarse aggregate
6. To determine the percentage bulking of fine aggregate
7. To determine compressive strength of nominal mix concrete of a given grade
8. To determine the workability of concrete by various methods
9. To determine the split tensile strength of concrete of given mix proportions
10. To determine soundness of given cement by Le-Chatelier method
11. Effect of water cement ratio on strength of concrete
12. Concrete mix design

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- 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 practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-12
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

Study material of Building Materials lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:

1. ‘A Text Book of Building Construction” by Arora, S.P. & Bindra, S.P., Dhanpat Rai & Sons, Delhi.
2. “Building Construction”, by Jha, J. & Sinha, S.K., Khanna Publishers, Delhi
3. “A Text Book of Engineering Materials”, by Kulkarni, C. J., Ahmedabad Book Depot, Ahmedabad, 1968.

Reference Books:

1. “Building Construction”, by Kumar Sushil, Standard Publishers, Distributors, Delhi.
2. “Building Construction, by McKay W.B., “Vol.1 to 4, Orient Longman Ltd.,

Course Description

Title: Surveying Lab
L-T-P scheme:0-0-2

Code: CE207
Credit: 1

Prerequisite: NIL

Objective: To learn the fundamental principles and procedures to carryout different types of surveys, and their applications in the field of civil engineering

Learning Outcomes:

Course Outcome	Description
CO1	Outline the steps to survey any given land/field.
CO2	Describe the procedures for surveying a given region.
CO3	Develop the concepts of trigonometric surveying.
CO4	Identify suitable equipments for surveying
CO5	Apply suitable permanent and temporary adjustment to instruments.
CO6	Design and represent the data obtained from surveying and plot them to suitable scale.

Course Content:

List of Experiments:

1. Chain survey
2. Compass survey
3. Plane table survey
4. Simple leveling
5. Profile leveling
6. Longitudinal & Cross section
7. Contouring
8. Theodolite
9. Tachometry
10. Areas & Volumes
11. Traversing
12. Trigonometric leveling.
13. Total station

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in practical which carries marks.

- At regular intervals assignments will be given. Students should submit all assignments during given period.
- 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 practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-13
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

Study material of surveying lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:

1. Surveying, Vol. I & II by Agor, R. Khanna Publications, Delhi
2. Surveying, Vol. I & II by Arora, K.R., Standard Book House, Delhi,
3. Solving Problems in Surveying, by Bannister, A. and Baker, R., Longman Scientific Technical, U.K.
4. Engineering Surveying Technology, by Kennie, T.J.M. and Petrie, G., Blackie & Sons Ltd., London.
5. Surveying, Vol. I & II, by Punmia, B.C., Laxmi Publications New Delhi,

Reference Books:

1. Surveying Vol. I & II by Duggal, S.K., TMH
2. Surveying by N.N. Basak, TMH.
3. Surveying Vol. I, II by Kanetkar
4. Plane Surveying, by Chandra, A.M. New Age International Publishers, Delhi
5. Higher Surveying by Chandra, A.M. New Age International Publishers, Delhi

Course Description

Title: Mechanics of Fluid Lab
L-T-P scheme: 0-0-2

Code: CE205
Credit: 1

Prerequisite: Nil

Objectives:

Laboratory experiments are helpful for civil engineering students for understanding the flow phenomenon in pipes and channels

Learning Outcomes:

Course Outcome	Description
CO1	Outline the fluid and flow properties
CO2	Describe The flow measuring devices used in pipes, channels and tanks
CO3	Characterize laminar and turbulent flows
CO4	Identify the types of flow and flow measurements.
CO5	Apply fundamental principles for flow characterization.

Laboratory Experiments:

1. Determination of metacentric height
2. Calibration of a venturi meter
3. Determination of frictional losses in pipes of different diameters.
4. Determination of minor losses in pipes
5. Calibration of pitot tube
6. Calibration of a, V - notch and rectangular notch
7. Reynolds dye experiment for flow characterization
8. Determination of C_c , C_v and C_d of an orifice
9. Verification of Bernoulli's theorem
10. Calibration of orifice meter
11. Verify the impulse momentum equation (impact of jet)
12. Performance characteristics of a centrifugal pump

Teaching Methodology:

This course is introduced to help students to understand the concepts of fluid mechanics experimentally.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-12
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Text Books:

1. Fluid Mechanics laboratory manual by G. L. Asawa
2. Fluid Mechanics & Hydraulics by A. K. Jain
3. Fluid Mechanics & Hydraulics by Modi & Seth

Reference Books:

1. Fluid Mechanics & Hydraulics by Gupta & Alam Singh.
2. Fluid mechanics & Hydraulics by Garde
3. Fluid Mechanics by A. K. Bansal
4. Open channel hydraulics by K. Subramanya

Course Description

Title: **Geotechnical Engineering Lab**
L-T-P scheme: 0-0-2

Code: **CE203**
Credit: **1**

Prerequisite: Nil

Objectives:

1. To learn the fundamentals and testing procedures of soil
2. To learn soil classification
3. To learn the index and engineering properties of soils

Learning Outcomes:

Course Outcome	Description
CO1	Outline Index properties of soil
CO2	Describe Particle sizes analysis, plasticity, permeability and compressibility of soil.
CO3	Develop the concepts soil properties by classification of soil.
CO4	Identify the soil behavior with moisture content.
CO5	Apply the concepts of soil shear strength and consolidation.
CO6	Demonstrate the effect of water content on soil and engineering properties.

Laboratory Experiments:

1. Moisture content determination by oven drying method, pycnometer method, and rapid moisture meter
2. Specific Gravity of soil particles by Pycnometer method and Density Bottle method
3. Particle size distribution of soils (Grain size analysis) by Sieve analysis and Hydrometer analysis.
4. Liquid limit and Plastic limit test
5. Shrinkage limit test
6. Field density tests of soils by Core Cutter method
7. Field density tests of soils by Sand Replacement method
8. Permeability tests of soils by Variable head method
9. Permeability tests of soils by Constant head method
10. Light compaction test (Density moisture relations)
11. Heavy compaction test (Density moisture relations)

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of soil testing. This course has been divided into twelve units and each section includes the practical exercises to help the students gain more experience in geotechnical field.

Evaluation Scheme:

Exam		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-5
P-2		15 Marks	Based on Lab Exercises: 6-11
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100	

Learning Resources:

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture& slides available in NPTEL site

TEXT BOOKS:

1. Geotechnical Engineering by C. Venkatramaiah, New Age International, 2006.
2. Geotechnical engineering lab manual.

REFERENCE BOOKS:

1. Geotechnical Engineering by Sahashi K. Gulhati, ManojDatta - 2005.
2. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri, Wiley-IEEE, 1996.
3. Principles of Geotechnical Engineering by Braja M. Das, PWS-KENT Pub. Co. 1990.

Course Description

Title of Course: Programming in Python

Course Code: CSXXX

L-T-P scheme: 0-0-2

Course Credits: Audit

Prerequisite: No explicit prerequisite course work is required, but students are expected to have a fundamental understanding of basic computer principles and previous experience using a personal computer.

Objective: To emphasize object-oriented programming. Problem decomposition and principles of programming are stressed throughout the course. Advance aspects of programming may be taken care off through Python.

Learning Outcomes:

Course Outcome	Description
CO1	Installation and understanding features of Python.
CO2	Describe Python data types to handle programming problems
CO3	Develop understanding looping to handle new data types
CO4	Identify appropriate methods to solve challenging problems.
CO5	Apply programming knowledge to solve real world problems in the form of Project

Course Contents:

An Introduction to Python: Introductory Remarks about Python, Strengths and Weaknesses, A Brief History of Python, Python Versions, Installing Python, Environment Variables, Executing Python from the Command Line, IDLE, Editing Python Files, Getting Help, Dynamic Types, Python Reserved Words, Naming Conventions.

Basic Python Syntax: Introduction, Basic Syntax, Comments, String Values, String Operations, The format Method, String Slices, String Operators, Numeric Data Types, Conversions, Simple Input and Output, The print Function.

Language Components: Introduction, Control Flow and Syntax, Indenting, The if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop.

Collections: Introduction, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections, Summary.

Functions: Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function,

Variable Number of Arguments, Scope Functions- “First Class Citizens”, Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Closures.

Text Book

1. Programming Python /Mark Lutz.

Reference Books

1. Think Python / Allen B Downey
2. Python 101 / Dave Kuhlman

Evaluation scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

FOURTH SEMESTER

Course Description

Course Name: Concept of Digital Marketing
L-T-P Scheme: 3-0-0

Code: HS304
Credit: 3

Prerequisite: None

Objective:

1. Learn cutting-edge Digital Marketing techniques like Search Engine Optimization, Search Engine Marketing, Social Media Marketing, Mobile Marketing, Analytics and Digital Strategy.
2. Measure, Analyze and Optimize Social Media Marketing Campaigns

Learning Outcome

At the end of the course, the students should:

CO1	Develop successful written, visual, and digital communication skills essential for a career in digital marketing including social media marketing. Discuss the key elements of a digital marketing strategy.
CO2	Apply digital marketing methods to select the best digital & social media tools for the target audience to achieve optimum results.
CO3	Acquire and illustrate social media listening skills for effective evaluation of social media tools and marketing.
CO4	Understand the need to identify cultural, global and societal influences to digital marketing.
CO5	Identify the social trends that influence digital and social media tools and strategy.
CO6	Describe how changing technology impacts the Digital Marketing environment.

Course Description

Unit 1: Introduction to Digital Marketing, Strategies in Digital Marketing. Search Engine Optimization – (Understand the search engine as default entry point to internet. Learn how to get website listed among top search engine results) - Search Engine working, Crawlers, ranking algorithm and techniques. Types of search engines, white hat SEO, black hat and grey hat SEO, on page optimization and techniques.

Unit 2: Search Engine Marketing – Basics of marketing, Inbound and outbound marketing, Appreciate the role of pay per click in website listing. Learn how to effectively run ads on Search Engines. Email Marketing– Learn how to effectively build your users lists, deliver e-mails & generate relevant clicks.

Unit 3: Social Media Marketing– Learn how to build brand, generate leads & aggregate audience on Social Media. Inbound Marketing– Learn how to attract & convert customers by earning their trust through various techniques such as content marketing.

Unit 4: Web Analytics – Basic web analytics process, web analytics technologies, log file analysis, Best Web Analytics Tools: Clickstream Analysis Tools, Content and Blog Marketing– Increasing audience engagement through content marketing. Learn to use white paper, brochure, and case studies for unique interaction.

Unit 5: Mobile Marketing– Strategizing marketing through smart devices. Learn App-based marketing, QR codes, Location-based marketing, SMS marketing.

Teaching Methodology:

This course will be taught through the Powerpoint, case studies and discussions.

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:

Lecture slides and other study material on Digital Marketing (will be added from time to time): Digital copy will be available on the JUET server.

Text Books

- 1.”Digital Marketing: Strategy, Implementation & Practice”; Dave Chaffey & Fiona Ellis-Chadwick, Pearson, 2019
2. “The Power of Visual Storytelling”; Ekaterina Walter, McGrawHill, 2014

Web References:

1. <https://neilpatel.com › what-is-digital-marketing>
2. <https://www.digitalvidya.com › blog › learn-digital-marketing-guide>

Course Description

Title: Water Supply Engineering
L-T-P scheme: 3-1-0

Code: CE109
Credits: 4

Prerequisite: Students must have already studied courses on ‘Mechanics of Fluid’ and ‘Environmental Sciences’.

Objectives:

To familiarize the students with the basics of water quality and its treatment methods and importance of planning and execution of modern water supply schemes.

Learning Outcomes: At the end of the course, student will be able to understand the important concepts of good water supply system.

Course Outcome	Description
CO1	Outline Sources, characteristics and distribution of water as per demand.
CO2	Describe the distribution system, its planning and quality analysis.
CO3	Develop the design of water distribution systems.
CO4	Identify Types of pumps and their choice.
CO5	Apply Concepts of reservoirs and treatment of water.
CO6	Design components of water supply systems.

Course Content:

Unit-1: Introduction: Importance of planned water supplies; financing, planning and execution of modern water supply schemes.

Unit-2: Water demands: Various types of demands; the per capita demand: variations in demand; design periods; population forecasting by various methods.

Unit-3: Sources of water: Kinds of water sources and their characteristics; factors governing the selection of a source of water supply.

Unit-4: Quality of water: physical, chemical and biological characteristics of water, common water born diseases and standards of purified water for various purposes.

Unit-5: Treatment of water: screening and types; aeration units; sedimentation; sedimentation tanks and their types; sedimentation aided with coagulation; classifications of filters and their constructional and operational details.

Unit-6: Disinfection: Methods of disinfection; chlorination and its types.

Unit-7: Water softening: Importance of water softening; lime- soda process; zeolite process.

Unit-8: Miscellaneous treatment methods: Removal of colour, odour and taste, iron and manganese; fluoridation and defluoridation.

Unit-9: Collection and Distribution of water: Intakes for lakes, streams and rivers; methods of distribution; concept of service and balancing reservoirs; Design of water distribution systems; analysis of pipe networks by Hardy Cross method, equivalent pipe method, Layout of distribution system; the house water connection; construction and maintenance of distribution systems.

Unit-10: Pipes-Joints-Fittings: various types of conduits; testing and inspection; joints in pipes; valves in pipe line.

Teaching Methodology: Incorporating sustainable design and operation principles based on innovative water technologies such as cost-effective treatment solutions, automated supervisory controls, leakage detection and control etc. into water supply systems improves water supply from sustainable perspectives. This course aims to discuss the technical aspects of modern systems for drinking water treatment and distribution in an integrated way. The course will cover topics from traditional aspects of demand calculations and source selections to the up-to-date treatment methods, network design tools etc. The course will also provide insight to smart water supply systems including automation, leakage detection. The financial sustainability of water supply systems and sustainable water pricing models will also be covered.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2, Unit-3 and Unit-4
Test-2	25 Marks	Based on Unit-5, Unit-6 & Unit-7 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-8 to Unit-10 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Water Supply Engineering by S.K. Garg, Khanna publishers.
2. Water Supply and Sanitary Engineering by Birdie, Dhanpat Rai Publications.
3. Environmental Engineering by Peavy, Rowe and Tchobanoglous, McGraw-Hill international editions.

Reference Books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi.
2. Water Supply and Sewerage by Steel and McGhee.
3. Introduction to Environmental Engineering by Davis and Cornwell.
4. Water Supply and Wastewater Disposal by Fair and Geyer.
5. Water Supply and Wastewater Engineering Vol. I and II by Punmia.

Course Description

Title: Structure Analysis-I
L-T-P scheme: 3-1-0

Code: CE110
Credits: 4

Prerequisite: Engineering Mechanics, Mechanics of Solids

Objective:

1. To calculate loads for structural analysis
2. To identify determinate, indeterminate, stable and unstable structures.
3. To determine forces and deflections in determinate trusses, beams and frames.
4. To determine forces in indeterminate trusses, beams and frames by the force method.
5. To construct influence lines and be able to use them
6. To use computer tools to assist in classical structural analysis

Learning Outcomes:

Course Outcome	Description
CO1	Outline the equilibrium of structure.
CO2	Identify suitable method to solve a given problem.
CO3	Analyze the results obtained by solving the given problem.
CO4	Describe the structural behavior based on the results of analysis.
CO5	Determine the bending moment diagram and shear force diagram of determinate and indeterminate structures.
CO6	Apply the various approaches studied to analyze the real time problem.

Course Content:

Unit-1: Statically determinate & indeterminate structures, Analysis of statically determinate structures.

Unit-2: Castigliano's theorem, Maxwell-Betti's theorem

Unit-3: Analysis of plane redundant frames up to two degree of redundancy by energy method, Slope deflection method

Unit-4: Moment distribution method, Analysis of propped cantilever, fixed beam, continuous beam, Clapeyron's three-moment theorem, Buckling of columns

Unit-5: Suspension cables, introduction to numerical methods in structural engineering. Introduction to MIDAS Gen Software.

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 Structure Analysis-I (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Basic Structural Analysis by C.S Reddy, Prentice Hall of India Pvt. Ltd.
2. Analysis of Structures by Vazirani & Ratwani, Khanna Publishers
3. Analysis of Structures by Ramamrutham, Dhnapat Rai & Company

Reference Books:

1. Strutural Analysis by A. Ghali and A M Neville, E & FN SPON, Fourth Edition
2. Strutural Analysis by R C Hibbeler, Pearson Education, Fifth Edition

Course Description

Title: Environmental Engineering Lab
L-T-P scheme: 0-0-2

Code: CE209
Credit: 1

Prerequisite: Nil

Objectives:

Laboratory experiments are helpful for civil engineering students for understanding the physical, chemical and biological parameters of given water sample.

Learning Outcomes: At the end of the course, student will be able to understand the physical, chemical and biological characteristics of water.

Course Outcome	Description
CO1	Outline the physical, chemical and biological characteristics of water and wastewater
CO2	Describe optimum dosage of coagulant
CO3	Characterize the qualities of water and wastewater
CO4	Identify the suitable method of water treatment for a given water sample.
CO5	Apply fundamental principles of primary, secondary or tertiary water treatment method.

Laboratory Experiments:

1. To determine pH, turbidity, electrical conductivity of the given sample.
2. To determine the acidity and alkalinity of the given water sample.
3. To estimate the concentration of chlorides and salinity in the given water sample.
4. To determine the total hardness, calcium and magnesium in the given sample.
5. To find out total settleable solids in the given water sample.
6. To find out total solids of the given sample.
7. To find the amount of Sulfate in the given water sample.
8. To determine the Fluoride in the given water sample.
9. To find out the amount of iron & manganese present in the given water sample.
10. To determine the optimum coagulant dose quantity for given sample of raw water.
11. To determine chlorine demand and residual chlorine.
12. To determine most probable number (MPN) of coliforms of the given sample.
13. Field visit of water treatment plant.

Teaching Methodology:

This course is introduced to help students to determine the characteristics of water and wastewater experimentally.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-13
Day-to-Day	Viva	20 Marks	70 Marks

Work	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Text Books:

1. Environmental Engineering laboratory manual by Kotaiah and Kumaraswamy, Charotar publishing house, Anand, India.
2. Water and Wastewater Testing by Mathur, New Chand& bros (publishers) Roorkee.
3. Chemistry for Environmental Engineering by Sawyer, McCarty and Parkin, McGraw Hill, New York.

Reference Books:

1. Standard Methods for the Examination of Water and Wastewater. 20th ed., American Public Health Association, Washington DC, USA.
2. A manual on water and wastewater analysis by NEERI, Nagpur.
3. Analysis of water and wastewater, BIS publications, New Delhi.

Course Description

Title: Engineering Geology lab

L-T-P scheme: 0-0-2

Code: CE210

Credit: 1

Prerequisite: Nil

Objectives:

1. To learn the internal and external structure of earth and development of geological surface on it.
2. Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the geological formation and weathering process.
CO2	Describe subsurface information and groundwater potential sites through geophysical investigations
CO3	Develop methods for mitigation of natural hazards through proper site selection.
CO4	Identify the properties of minerals and rocks.
CO5	Apply geological principles to major civil engineering structures.
CO6	Demonstrate geological structures and processes for rock mass quality

Laboratory Experiments:

1. Study of minerals
2. Petrology- Formation and classification of rocks
3. Stratigraphy of India
4. Structural geology- Strike and dip
5. Structural geology- Classification of folds
6. Structural geology- Faults, joints, unconformities
7. Geological investigation- Interpretation of geological maps
8. Earthquakes and landslides: Classification, causes and effects of earthquakes and landslides seismic problems of India
9. Geology of dams and reservoirs
10. Geological studies in tunneling
11. Geological studies in bridges
12. Geological considerations in road alignment

Teaching Methodology:

This course is introduced to help the students to understand weathering process and mass movement, identify geological formations, structures for rock mass quality assessment, identify subsurface information and groundwater potential sites through geophysical investigations.

Evaluation Scheme:

Exam		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-12
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100	

Learning Resources:

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

TEXT BOOKS:

1. Engineering Geology for Civil Engineers By P. C. Verghese, Phi Learning Pvt. Ltd., 2011.
2. Engineering geology lab manual.

REFERENCE BOOKS:

1. Engineering & General Geology by Parbin Singh, S.K. Kataria & Sons; Reprint 2013
2. Principles of Engineering Geology and geotechnics by Krynine and Judd, CBS (2005)
3. Fundamentals of Engineering Geology A Textbook By Prof. Dr. Hussein H. Karim, University of Technology Printing Press Department, University of Technology, Baghdad, Iraq

FIFTH SEMESTER

Course Description

Title: Concepts of Financial Management

L-T-P scheme: 2-1-0

Code: HS302

Credit: 3

Prerequisite: Students must have already studied fundamentals of management and accounts.

Objective:

6. To learn and be able to implement financial principles and techniques.
7. To develop the abilities to call oneself a professional having beginners knowledge about managing finance.

Learning Outcomes:

After successful completion of course, students should be able to:

Course Outcome	Description
CO1	Outline various concepts of valuation with respect to present and future value of money, annuity & perpetuity.
CO2	Describe basics of finance together with the role of a finance manager in an organization.
CO3	Develop an understanding of use of debt to amplify returns from a project (leverage) and how to distribute the profits earned by the organization (dividend policy).
CO4	Identify and use various techniques to evaluate investment decisions viz IRR, Payback Method, ARR, Cost of Capital including valuations of stocks and bonds.
CO5	Apply ratio analysis to evaluate a number of issues with a business entity, such as its liquidity, efficiency of operations, profitability and thereby widen knowledge about various financial statements.
CO6	Deploy and be proficient in various sources of long term financing and concepts of working capital management.

Course Content:

Unit 1: Nature of Financial Management and Concepts of Values and Return

Definition of Financial Management, Scope of Finance, Finance Functions, Financial Manager's Role, Financial goal, Agency problem, Future Value of a Single Cash Flow, Future value of an Annuity, Sinking Fund, Present Value of a Single Cash Flow, Present Value of an Annuity, Capital Recovery, Present Value of an Uneven Cash Flow, Value of an Annuity Due, Long Term Sources of Finance – Definition, Types, Advantages and Disadvantages.

Unit 2: Investment Decisions

Nature of Investment Decisions, Types of Investment Decisions, Investment Evaluation Criteria – NPV, IRR, Profitability Index, Payback Method, Discounted Payback Period and Accounting Rate of Return, NPV versus IRR, Definition, measurement of specific costs, computation of Overall Cost of Capital, Valuation of bonds and stocks, Concepts of Risk and Return, Significance of Cost of Capital, Cost of Debt, Cost of Preference Capital, Cost of Equity Capital, Cost of Equity and Capital Asset Pricing Model, CAPM Versus Dividend-Growth Model, Weighted Average Cost of Capital

Unit 3: Financing and Dividend Decisions

Capital Structure, Meaning of Financial Leverage, Measures of Financial Leverage, Financial Leverage and Shareholders' Return, Combining Financial and Operating Leverages, Financial Leverage and Shareholders' Risk, Objectives of Dividend Policy, Practical Considerations in Dividend Policy, Stability of Dividends, Forms of Dividend, Share Split, Buyback of Shares.

Unit 4: Financial and Profit Analysis

Balance Sheet, Profit and Loss Account, Changes in Financial Position, Funds Flow Statement, Cash Flow Statement, Uses of Statement of Changes in Financial Position, Users of Financial Analysis, Nature of Ratio Analysis, Liquidity Ratios, Leverage Ratios, Activity Ratios

Unit 5: Long Term Financing and Working Capital Management

Ordinary Shares, Rights Issue of Equity Shares, Preference Shares, Debentures, Concepts of Working Capital Management, Operating and Cash Conversion Cycle, Permanent and Variable Working Capital, Balanced Working Capital Position, Determinants of Working Capital, Issues in Working Capital Management, Estimating Working Capital Needs, Policies for Financing Current Assets.

Teaching Methodology:

This course is introduced to help students transition from a non finance professional to an abecedarian in financial management. The entire course is broken down into five separate units: Concepts of finance, Investment Decisions, Financing and Dividend Decisions, Financial and Profit Analysis, Long Term Financing and Working Capital Management. Each section includes multiple techniques to help a student gain more knowledge as a novice in finance. The lectures are well complemented by tutorials that help a student learn application. Learning is made deep and interesting with the use of powerpoints, excel sheets, videos, live examples, discussions and other relevant teaching and learning aids.

Evaluation Scheme:

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

Learning Resources:

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

Text Books:

- [3] “Basic Financial Management”; Khan and Jain, Tata McGraw-Hill Education Publication, 2e, 2005.
- [4] “Financial Management”; I M Pandey, Vikas Publication, 11e, 2015.
- [5] “Financial Management”; Paramasivan and Subramanian, New Age International, 5e, 2012.

Reference Books/Material:

- [1] “Financial Management”, Sudhir Gupta, Centrum Press, 2011.
- [2] “Financial Management”, Periasamy, Tata McGraw-Hill Education Publication, 3e, 2012.

Web References:

- [1] <https://www.bank4success.in/2018/09/financial-management-theory-and.html>
- [2] <http://www.techtutorials.info/ecommerce.html>
- [3] [https://hostnezt.com/cssfiles/businessadmin/Fundamentals of financial management](https://hostnezt.com/cssfiles/businessadmin/Fundamentals%20of%20financial%20management)

Journals References:

- [1] Journal of Financial Studies
- [2] Journal of Investing
- [3] Journal of Risk and Uncertainty
- [4] The Journal of Portfolio Management

Course Description

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

Code: CE111
Credits: 3

Prerequisite: Structural Analysis-I

Objective:

The objective is to have students understand primary mechanisms of behavior and the basic criteria for design of simple reinforced concrete beams, columns and slabs

Learning Outcomes:

Course Outcome	Description
CO1	Outline the differences between different philosophies of reinforced concrete design: limit state and working stress methods.
CO2	Identify the structural behavior of different structural members in a reinforced concrete structure.
CO3	Analyze the design forces and moments in members.
CO4	Describe the design process flexure, shear and torsion in beams slabs and stair cases.
CO5	Enumerate the design steps and their significance for structural design.
CO6	Design columns: axial, uniaxial and biaxial and design footing: isolated and combined.

Course Content:

Unit-1: Introduction to the design of Concrete structures, Working& Limit state concepts

Unit-2: Design of beams (singly & doubly reinforced, T-beams & L-beams);

Unit-3: Design of columns, Joint Detailing

Unit-4: One and two-way Slabs. Stair cases,

Unit-5:Footings, Retaining wall;

Unit-6:Bar bending Schedule through MS-Excel, introduction to Auto Rebar/Bend Works software.

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-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 Design of Concrete Structures (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee
2. Limit State Design of Reinforced Concrete by P.C. Varghese, Prentice Hall of India

Reference Books:

1. Reinforced Concrete Design by Wang & Salmon
2. BIS Code of Practice for Plain & Reinforced Concrete - IS 456
3. BIS Code of Practice for Design Loads (Other than Earthquake) For Buildings & Structures IS875: Part I-V
4. Reinforced Concrete Design by Devdas Menon & S. Pillai, TATA McGraw-Hill
5. Reinforced Concrete Structures by Robert Park & Thomas Paulay, Wiley India Pvt Ltd

Course Description

Title: Highway Engineering
L-T-P scheme: 3-1-0

Code: CE112
Credits: 4

Prerequisite: Surveying

Objectives:

1. To learn the fundamentals of highway and to implement them in design.
2. To develop a computer based system for fast and efficient design of highways.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the scope of highway engineering, surveys and highway alignment
CO2	Describe various traffic engineering characteristics, traffic operation, intersections, parking facilities and traffic planning of a city
CO3	Develop different types of materials and their testing methods to assess quality control in pavements
CO4	Identify the methods and materials for strengthening of existing pavements
CO5	Apply the basic design concepts in pavement design and overlay design
CO6	Demonstrate highway geometric design elements, sight distances, super elevation, curves, horizontal and vertical alignment

Course Content:

Unit-1: Importance of transportation: Different modes, characteristics & scope of highway engineering in India. Highway development in India, classification of roads, planning surveys, highway planning in India. Highway alignment: Engineering surveys, drawings and report, realignment.

Unit-2: Geometric design: Introduction cross section elements, sight distance, design of horizontal and vertical alignment of highways.

Unit-3: Traffic engineering: Introduction, characteristics, traffic operation, intersections, signals, parking facilities, lighting and traffic planning

Unit-4: Highway materials: Sub grade soil, evolution of soil strength, modulus of sub grade reaction, C.B.R test, tests on road aggregate, types of bituminous materials, tests on bitumen. Marshal method of mix design.

Unit-5: Pavement Design: Types of pavements, design factors, design of flexible pavements by G.I method, C.B.R. method, Burmister's method and design of rigid pavements, I.R.C. guidelines in pavement design.

Unit-6: Highway construction: Construction of earth roads, gravel roads, W.B.M. roads, bituminous and cement concrete pavement, joints in pavement. Highway maintenance: Pavement failures, maintenance of bituminous & cement concrete pavements, strengthening of existing pavements, surface and sub surface drainage of pavements.

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of highways. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a highway designer. This theory course is well complemented by a laboratory course under the name 'Highway engineering lab' in the same semester that helps a student to learn more practical knowledge and experience.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Highway Engineering by 'S.K.Khanna& C E G Justo' Nem Chand& Bros. Roorkee.
2. Transportation Engineering, by 'C.JotinKhisty&B.KentLall; Pearson India education services Pvt. Ltd, Noida, UP.
3. IRC codes and Manuals.

REFERENCES:

1. Traffic engineering & Transportation planning, L.R.Kadiyali, Khanna Publishers, New Delhi (1997).
2. Traffic and Transportation engineering by 'Animesh Das and P. Chakraborty', PHI Learning Pvt. Ltd. Delhi.
3. Principles of Urban Transportation System Engineering, B.G.Hutchinson', TMG, Publication.
4. Principles and practices of Highway Engg, L.R.Kadyali&N.B.Lal, Khanna Publishers, Delhi (2006).
5. Principles of pavement design, Yoder.E.J&Witezac, John Wiley & Sons,U.S.A.

Course Description

Title: Construction Technology & Management

L-T-P scheme: 3-0-0

Prerequisite: Nil

Code: CE301

Credits: 3

Objectives: To provide graduates with knowledge and skills that are valued and sought by the construction industry profession.

Learning Outcomes: At the end of the course, student will be able to design project network and utilization of various heavy equipments.

Course Outcome	Description
CO1	Outline the roles and responsibilities of a project manager
CO2	Describe the schedule of activities in a construction project
CO3	Develop the network as control technique for a project.
CO4	Identify the contract document for a construction project
CO5	Apply the principles of operation cost to Identify the equipment used in construction
CO6	Understand safety practices in construction industry

Course Content:

Unit-1: Introduction to various operations in construction, execution and management.

Unit-2: Introduction to network based project management techniques: Defining activities and their interdependence, drawing of network, time and resource estimations, and use of network as scheduling techniques, use of network as control technique.

Unit-3: Selection of construction equipment cost of owning and operating, capacity and utilization, breakdown analysis, economic life, replacement of equipment and sinking fund.

Unit-4: Standard and special construction equipments, heavy earthmoving equipments, shovels and cranes, crushing plant, batching plant, bitumen plant.

Unit-5: Techniques and equipments for concreting, tunneling, road pavement, dewatering, drilling, blasting and grouting.

Unit-6: Form works, their design, fabrication and uses.

Unit-7: Types of contract, contract documents, arbitration and settlement of disputes, contract laws and handling of contracts

Unit-8: Use of information technology in construction industries Uses and design of scaffoldings Steel constructions; fabrication and erection techniques.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2 and Unit-3.
Test-2	25 Marks	Based on Unit-4, Unit-5 and Unit-6 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-7 and Unit-8 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Construction Planning & Management by U K Shrivastava, Galgotia Publications.
2. Construction Planning, Equipment & Methods by Peurifoy, TMH.

Reference Books:

1. Construction Equipment and Management by S C Sharma, Khanna Publishers.
2. Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders, by Chris Hendrickson and Tung Au, Prentice Hall, Pittsburgh, 2000.
3. Financial and Cost Concepts for Construction Management by Halpin, D. W., John Wiley & Sons, New York, 1985.

Course Description

Title: Construction Planning and Project Management

Code: CE302

L-T-P scheme: 3-0-0

Credits: 3

Prerequisite: Nil.

Objective: The objective of this course is to provide graduates with knowledge and skills that are valued and sought by the construction industry profession in planning and management.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the roles and responsibilities of a project manager
CO2	Describe the building plan in a construction project
CO3	Develop the network as control technique for a project.
CO4	Identify the resource allocation for a construction project
CO5	Apply the principles of cost control in construction
CO6	Understand the Earned Value Analysis and other progress metrics

Course content:

Unit-1: 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.

Unit-4: Prepare and presenting schedule information; assigning and analyzing resource requirements of a project.

Unit-5: Performing time/cost trade-off analyses; justifying claims for additional time.

Unit-6: Processing schedule information in a computerized scheduling package.

Unit-7: Controlling cost by applying the Earned Value Analysis and other progress metrics

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2 and Unit-3
Test-2	25 Marks	Based on Unit-4 and Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 and Unit-7 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Construction Planning & Management by U K Shrivastava, Galgotia Publications
2. Construction Planning, Equipment & Methods by Peurifoy, TMH

Reference Books:

1. Construction Equipment and Management by S C Sharma, Khanna Publishers
2. Engineering Economics, by J. L. Reggs McGraw Hill Co., 1976.
3. Techniques of Value analysis and Engineering, by D. Miles, McGraw Hill co., 1970.
- 4 Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders, by Chris Hendrickson and Tung Au, Prentice Hall, Pittsburgh, 2000.
5. Halpin, D. W., Financial and Cost Concepts for Construction Management by John Wiley & Sons, New York, 1985.

Course Description

Title: Sewage Treatment & Disposal

Code: CE310

L-T-P scheme: 3-0-0

Credit: 3

Prerequisite: Water Supply Engineering

Objective: The objective of this course is to give the students the basics of sources of waste water, characteristics, and modes of collection, treatment methods and options for disposal.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the characteristics of Sewage Treatment
CO2	Describe pollution effects of disposal of Sewage Treatment
CO3	Develop the method of sewage treatment.
CO4	Identify the wastewater disposal method and reuse.
CO5	Apply the principles of operation cost to Identify the equipment used in construction
CO6	Understand safety practices in construction industry

Course Content:

Unit-1: Introduction: sewage, sewerage, sullage, systems of sanitation, sewerage systems, estimation of quantity of sewage and patterns of collection systems.

Unit-2: Sewers: types, shapes, materials, design, laying and testing of sewers

Unit-3: Quality and characteristics of sewage: Decomposition of Sewage (N,C & S cycles), physical, chemical & biological characteristics of sewage.

Unit-4: Treatment of sewage: Basics of primary, secondary and tertiary treatment, screening, grit chamber, comminuting, trickling filters, activated sludge process, rotating biological contactors, ponds and lagoons, septic tank, imhoff tank, advanced waste water treatment: nutrient removal and solids removal.

Unit-5: Sludge: Thickening, digestion, dewatering and disposal of sludge, anaerobic digester.

Unit-6: Wastewater Disposal and Reuse: Disposal of sewage, reduction of BOD, land disposal, discharge in to rivers. Lakes and ocean, self purification of streams and Zones of pollution, oxygen sag curve, recycle and reuse of waste effluents.

Unit-7: Plumbing systems: systems of plumbing, pipes, traps and sanitary fittings.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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,Unit-6 and Unit-7 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text books:

1. Sewage Disposal and air pollution engineering by S.K. Garg, Khanna Publishers.
2. Water Supply, Waste disposal and Environmental pollution engineering by A.K. Chatterjee, Khanna publishers.
3. Water Supply and Sanitary Engineering by Birdie, Dhanpat Rai Publications.

Reference books:

1. Environmental Engineering by Peavy, Rowe and Tchobanoglous, McGraw-Hill international editions.
2. Wastewater Engineering: Treatment, disposal and reuse by Metcalf Eddy, McGraw-Hill editions.
3. Standard Methods for the Examination of Water and Wastewater. 20th ed., American Public Health Association, Washington DC, USA.
4. Wastewater treatment for pollution control and reuse by Archievala&Shyam R. Asolekar, TataMcgraw Hill.

Course Description

Title: Waste Water Engineering

Code: CE303

L-T-P scheme: 3-0-0

Credits: 3

Prerequisite: Sewage Treatment and Disposal.

Objective: The objective of this course is to provide graduates with knowledge and skills that are valued and sought for the waste water treatment plant.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the roles treatment processes and doses of coagulant.
CO2	Describe the water supply and wastewater treatment systems.
CO3	Develop the concept of primary, secondary and tertiary waste water treatment methods.
CO4	Identify the treatment efficiency of treatment units
CO5	Apply the principles of low cost waste water treatment systems
CO6	Understand the complete wastewater treatment plant.

Course content:

Unit-1: Water treatment: Unit operations and processes.

Unit-2: Sedimentation: Design of primary and secondary sedimentation tank, Settling and removal efficiency for discrete and flocculent settling.

Unit-3:Coagulation: coagulants and their reactions, determination of optimum dose of coagulant, design of rapid mix chamber. Flocculation, hydraulic and mechanical flocculators and their design, criteria for good flocculation.

Unit-4: Filtration: Design of slow sand and rapid sand introduction to dual media filters and mixed media filters. Disinfection: disinfectants, chlorination and practices of chlorination.

Unit-5:Water softening by lime soda process and ion exchange; calculation of dosage of chemicals. Design of water treatment plant.

Unit-6:Wastewater Treatment: Unit operations and processes. Preliminary and Primary treatment: screens, grit chamber and their design, sedimentation and chemical precipitation.

Unit-7:Secondary Treatment: Activated Sludge Process, aeration tanks, design of activated sludge units & modifications, trickling filters, theory and design using NRC equation. Anaerobic digestion of sludge, design of anaerobic digesters.

Unit-8:Tertiary Treatment: Introduction to microstraining, adsorption on activated carbon, solvent extraction, ion exchange, reverse osmosis, electrodialysis, ammonia stripping, nitrification and denitrification, biological phosphorus removal, advanced biological systems, chemical oxidation, design of low cost waste water treatment systems.

Unit-9:Design of complete wastewater treatment plant.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1,Unit-2 and Unit-3
Test-2	25 Marks	Based on Unit-4, Unit-5 and Unit-6 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-7, Unit-8 and Unit-9 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text books:

- 1.Wastewater Engineering: Treatment, disposal and reuse by Metcalf Eddy, McGraw-Hill editions.
2. Waste Water Treatment, by M.N. Rao & A. K. Dutta, Oxford & IBH publishers, New Delhi.
3. Wastewater Treatment for Pollution Control and Reuse by Archievala&Shyam R. Asolekar, Tata Mcgraw Hill
5. Industrial Water Pollution Control by Eckenfelder W.W, Mc-Graw Hill publications.
6. Industrial Wastewater Management Handbook, by Azad, Hardom Singh, McGraw Hill publications.
7. Industrial Waste Water Treatment, by A. D. Patwardhan, Prentice Hall of India, Private Limited, New Delhi.

Reference books:

1. Design of Wastewater Treatment, - S.R. Quasim, CBS Publications, U.S.A.
2. Environmental Engineering by Peavy, Rowe and Tchobanoglous, McGraw-Hill international editions.
3. Wastewater Engineering- Treatment, Disposal, and Reuse- Metcalf & Eddy, McGraw-Hill Publishing Company Limited.

Course Description

Course Name : Mechanics of Fluid Machinery
L-T-P scheme: 3-0-0

Code: CE304
Credits: 3

Prerequisite: Mechanics of Fluid

Objective:

1. To give fundamental knowledge of fluid flow inside various fluid machinery.
2. To develop understanding about application of mass, momentum and energy equation in fluid flow.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the fundamental principle of fluid flow inside fluid machinery.
CO2	Describe the Reaction Turbines and pumps.
CO3	Develop the concept of Performance characteristics of fluid machinery.
CO4	Identify the types of turbine and pumps.
CO5	Apply the fundamental principles in hydraulic machines under different flow conditions.
CO6	Design the turbines and pumps on the basis of required standards.

Course Content:

UNIT-I

Introduction: Impulse of Jet and Impulse Turbines: Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel.

UNIT-II

Reaction Turbines: Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

UNIT-III

Centrifugal Pumps: Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

UNIT-IV

Positive Displacement and other Pumps: Reciprocating pump theory, Slip, Indicator diagram,

Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.

UNIT-V

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

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 Mechanics of Fluid Machinery (will be added from time to time): Digital copy will be available on the JUET server.

Spoken Tutorial (MOOCs): Spoken Tutorial MOOC, 'Course on OpenFOAM', IIT Bombay (<http://spoken-tutorial.org/>)

Text Book:

1. Hydraulic Machines by K Subramanya, Tata McGraw Hill
2. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
3. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
4. Fluid Mechanics and Turbo machines by Das, PHI
5. Fluid Power with Applications, by Esposito, Pearson
6. Fundamentals of Turbomachinery by Venkanna B.K., PHI

7. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
8. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

Reference Books:

1. Fluid Mechanics, Fluid Machines & Hydraulics by Gupta & Alam Singh, CBS Publishers & Distributors, New Delhi.
2. Fluid mechanics through problems by Garde, New Age International Publication, New Delhi.

Course Description

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

Code: CE305
Credits: 3

Prerequisite: Highway Engineering

Objectives:

1. To learn the fundamentals of traffic engineering and to implement them for developing a computer based system for fast and efficient design.
2. To solve problems related to traffic in the existing or new highway areas

Learning Outcomes:

Course Outcome	Description
CO1	Outline the administration and functions, road user and vehicle characteristics
CO2	Describe Speed, delays, vehicle volume counts, O&D surveys, parking surveys and statistical methods for traffic engineering
CO3	Develop varioustraffic signs,road markings, traffic signals, street furniture, street lightings for regulation and management of traffic
CO4	Identify the reasons forroad accidents and implement suitable measures for fast and efficient traffic flow
CO5	Apply the basic concepts for traffic forecasting and level of service
CO6	Demonstrate geometric design

Course Content:

Unit-1:Administration and functions, road user and vehicle characteristics

Unit-2:Speed, journey time and delay surveys, vehicle volume counts, classification and occupancy

Unit-3:O&D surveys, parking surveys, photographic techniques in traffic survey

Unit-4: Statistical methods for traffic engineering, Speed studies, traffic forecasting,geometric design,traffic signs,road markings

Unit-5:Traffic signals, street furniture, regulation of traffic, Road accidents

Unit-6:Highway capacity, basic diagram of traffic flow, Street lighting,traffic management

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of traffic planning and its design. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer of traffic in a city. This subject helps the student to learn more practical knowledge and experience in the field of trafficmanagement.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Traffic engineering & transportation planning, L.R. Kadiyali, Khanna Publishers, Delhi (1997).
2. Highway Engineering by 'A.K.Justo & S.K.Khanna' Nemchand Publ. Roorkee.

REFERENCES:

1. IRC codes and Manuals
2. Traffic and Transportation engineering by 'Animesh Das and P. Chakraborty', PHI
3. Principles of Urban Transportation System Engineering, B.G. Hutchinson', TMG, Publication
4. Principles and practices of Highway engg, L.R.Kadyali & N.B.Lal, , Khanna Publishers, Delhi (2006)
5. Transportation Engineering, an Introduction by 'C.JotinKhisty & B.KentLall; PHI,
6. Highway Traffic Analysis and Design N.B. Hounsell, Allbooks.tv (West Sussex, United Kingdom)

Course Description

Title: Advanced Concrete Technology
L-T-P scheme:3-0-0

Code: CE842
Credits: 3

Prerequisite: Building materials and construction

Objective:

To develop the knowledge in new & advance concrete technology used in the construction field

Learning Outcomes:

Course Outcome	Description
CO1	Outline the concrete ingredients and its influence at developing strength.
CO2	Describe the process of concrete mix design as per IS codes.
CO3	Develop the concepts of self compacting and high performance concrete.
CO4	Identify the parameters affecting the durability of concrete.
CO5	Apply the non-destructive techniques for assessment of distressed concrete and repair techniques.
CO6	Demonstrate different types of special concrete and its application.

Course Content:

Unit-1: Basic concrete Technology: Ingredients of concrete; cement, aggregate, mineral and chemical admixture, water, properties of concrete, workability, strength, durability,

Unit-2: essentials of concrete mix design, codal requirement. Approach to design for durability: Deleterious agencies, mechanism of attack, transport phenomena, ingress of liquids and gases in concrete, suction, permeability and diffusion, chloride diffusion coefficient, role of cover and mix proportion, latest provisions in modern code of practice

Unit-3: High Performance concrete: Definition, logical development, self compacting concrete, mix design, field practices, sustainable construction, role of mineral and chemical admixtures, examples as application in India.

Unit-4: Special Concrete: Light weight concrete, heavy weight concrete, Fiber Reinforced Concrete, Ferrocement, vacuum treated concrete, controlled permeability formwork. Quality control: Role of workmanship, batching, mixing, transportation, placing, compaction, curing, extreme weather concreting, role of RMC, Formwork Scheme, Introduction to formwork design with relevant codes of practice.

Unit-5: Statistical concept and acceptable criteria. Assessment of concrete and structures: Testing of concrete, accelerated strength test, core testing, nondestructive testing, load test on structures, distress investigations. Repair Techniques: Approach; planning for repair, material and procedure.

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

Text Books:

1. Neville, A.M. Properties of Concrete. ELBS Edition (4th ed.) Longman Ltd., London
2. Concrete technology by M.S. Shetty

Reference Books:

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: **Highway Engineering Lab**
L-T-P scheme: **0-0-2**

Code: **CE211**
Credit: **1**

Prerequisite: Surveying

Objectives:

1. To learn the fundamentals and testing procedures of aggregates and bitumen
2. To learn about the quality control techniques in pavements
3. To design bituminous mixes for pavements

Learning Outcomes:

Course Outcome	Description
CO1	Outline basic tests of aggregate
CO2	Describe various tests on bitumen
CO3	Develop the concept of assessing quality control in pavements
CO4	Identify the suitability of aggregate and bitumen for pavements
CO5	Apply the IRC concepts in bituminous mix design
CO6	Demonstrate the acceptable criteria of each test as per code

Course Content:

Unit-1: Aggregate crushing strength test

Unit-2: Los Angeles abrasion test

Unit-3: Aggregate impact test

Unit-4: Flakiness index & elongation index test

Unit-5: Penetration test

Unit-6: Ductility test

Unit-7: Softening point test

Unit-8: Flash & fire point test

Unit-9: Viscosity test

Unit-10: Determination of bitumen content by centrifuge extractor

Unit-11: Determination of Marshall stability and flow value

Unit-12: Determination of rebound deflection of pavement by Benkelman beam

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of high material testing. This course has been divided into twelve units and each section includes theory and practical exercises to help a student gain more experience in highway material testing. This theory course is well complemented by a theory course under the name 'Highway engineering' in the same semester that helps a student to learn more practical knowledge and field experience.

Evaluation Scheme:

Exam		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-12
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100	

Learning Resources:

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

TEXT BOOKS:

3. Highway Engineering by 'S.K.Khanna & C E G Justo' Nem Chand & Bros. Roorkee
4. Highway engineering lab manual.

REFERENCES:

1. Principles and practices of Highway Engineering, L.R.Kadyali&N.B.Lal, Khanna Publishers, Delhi (2006).
2. Traffic and Transportation engineering by 'Animesh Das and P. Chakraborty', PHI Learning Pvt. Ltd. Delhi.
3. BIS Code books, Bureau of Indian standards, New Delhi.
4. IRC Code books, Indian Road congress, New Delhi.

Course Description

Title: Civil Engineering Software Lab
L-T-P scheme:0-0-2

Code: CE212
Credit: 1

Prerequisite: Structure Analysis-I, Mechanics of Solids, Design of Concrete Structures

Objective:

To develop knowledge of Civil engineering software tools.

Learning Outcomes:

Course Outcome	Description
CO1	Outline and understand the need for software tools in analysis and design of Civil Engineering Systems
CO2	Identify the available open source software tools used for specific problems in Civil Engineering
CO3	Analyze the design forces and moments in members.
CO4	Describe the load transfer mechanism in structures.
CO5	Enumerate and use the latest software tools for Modeling and Analysis
CO6	Design various structural components for various types of structures.

Course Content:

Lab exercises:

1. Spreadsheet for calculating and drawing shear force and bending moment diagrams of determinate beam
2. Spreadsheet for designing a singly reinforced beam.
3. Spreadsheet for designing a doubly reinforced beam.
4. Primavera – Creating and analyzing a project – Project 1 part 1
5. Primavera – Creating and analyzing a project – Project 1 part 2
6. Primavera – Creating and analyzing a project – Project 2 part 1
7. Primavera – Creating and analyzing a project – Project 2 part 2
8. STAAD.Pro – Analysis of beams and plane frames
9. STAAD.Pro – Analysis of Trusses
10. STAAD.Pro – Analysis of a building for Gravity loads
11. STAAD.Pro – Analysis of a building for Wind loads
12. STAAD.Pro – Analysis of building for Earthquake load

Teaching Methodology:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- 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 practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 6-12
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

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

Text Books:

1. Basic structural analysis by C.S Reddy, Prentice Hall of India Pvt. Ltd.
2. Matrix Method of Analysis of Framed structure by Weaver and Gere, CBS Publication
3. Bhavikatti, S.S, Structural Analysis, Vol.1,& 2, Vikas Publishing House Pvt.Ltd.,NewDelhi4,2014.
4. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd,NewDelhi-4,2014.
5. Vazrani.V.N and Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
6. Pandit G.S. and Gupta S.P., Structural Analysis–A Matrix Approach, Tata McGraw Hill Publishing Company Ltd., 2006

Reference Books:

1. Advanced Structural Analysis with Computer Applications by Ashok K. Jain., Nemchand and Bros, Roorkee Pub.
2. Theory of Structures by B. C. Punamia

Course Description

Title: Minor Project 1
L-T-P scheme: 0-0-4

Code: CE213
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

SIXTH SEMESTER

Course Description

Title: Logical & Quantitative Technique

L-T-P scheme: 3-0-0

Code: HS305

Credit: 3

Prerequisite: None

Objective:

1. To familiarize the students with the concept and pattern of aptitude tests.
2. To solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives.
3. To acquaint them with types of questions asked in quantitative aptitude and logical reasoning.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic concepts of quantitative ability, logical reasoning skills, and verbal aptitude.
CO2	Describe the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, within a short time span.
CO3	Develop a thorough understanding of the concepts of quantitative ability and verbal reasoning, enabling students to manage the placement challenges more effectively.
CO4	Identify and work out the frequently asked patterns in quantitative aptitude and logical reasoning.
CO5	Sensitize students with the analytical skills which facilitate them to enhance their employability quotient and do well in the professional space.
CO6	Deployment and solve previous campus placements aptitude papers facilitating the students to compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

Course Content:

Unit-1: Numbers and Arithmetic: Number system, Percentages, Profit & Loss, Interest, Ratio, Proportion and Variation, Time and Work, Time, Speed and Distance. Trains, Boats and streams, Pipes and cisterns, Mixture and Allegations, Calendar.

Unit-2: Counting and Data Interpretation: Permutation & Combinations, Probability. Data Interpretation, Data Sufficiency, Set theory, Venn Diagrams.

Unit-3: Logical Reasoning: Important concept in logical reasoning, Logical reasoning based on arrangements, Logical reasoning based on rankings, Team formation, Quantitative reasoning, Puzzle test.

Unit-4: Verbal Reasoning: Syllogism, Logical deduction, Binary Logic, Critical Reasoning, Blood Relations.

Unit-5: Verbal Ability : Spotting Errors, Vocabulary and Reading Comprehension, Antonyms, Spellings, Ordering of Words, Sentence Improvement, Ordering of Sentences, Closet Test, One Word Substitutes, Change of Voice, Verbal Analogies, Synonyms, Selecting Words, Sentence Formation, Sentence Correction, Completing Statements, Paragraph Formation, Comprehension, Idioms and Phrases, Change of Speech, Precise writing.

Teaching Methodology:

The course “Logical & Quantitative Technique” is introduced with an integral focus on campus placement. This course would train the students on a variety of question types used by the companies and improve their language skill. The course will train the students on the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives. The course will also suit the need of the students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning. The course will be taught with the aid of lectures, handouts, case studies, task-based language learning, and comprehensive language learning through language lab.

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 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 handouts and e-books on Logical & Quantitative Technique (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

- [1] “Verbal and Non-Verbal Reasoning”; R.S. Agarwal, S. Chand Publishing, New Delhi, 2013.

Reference Books/Material:

- [1] “Quantitative Aptitude”; R.S. Agarwal, S. Chand Publishing, New Delhi, 2013.
[2] “English Grammar & Composition”; Wren and Martin, S. Chand Publishing, New Delhi, 2012.
[3] “Business Communication”; K.K. Sinha, Taxmann Publications, New Delhi, 4e, 2012.

Course Description

Title: Foundation Engineering
L-T-P scheme: 3-1-0

Code: CE113
Credits: 4

Prerequisite: Geotechnical Engineering

Objectives:

1. Understand the behavior of problematic soil
2. Design foundations on expansive soils
3. Analyze the lateral stability of piles and wells

Learning Outcomes:

Course Outcome	Description
CO1	Outline different types of shallow and deep foundations
CO2	Describe the bearing capacity of soils and foundation settlements
CO3	Develop the concepts of transferring the superstructure loads to ground surface.
CO4	Identify suitable foundation for different type of structures.
CO5	Apply the concepts of load transfer mechanism for shallow and deep foundation.
CO6	Design and analysis of different types of foundation

Course Content:

Unit-1: Foundation requirement, types and selection terminology.

Unit-2: Soil exploration techniques (SPT, CPT, pressure-meter tests etc.) and site investigation report.

Unit-3: Methods of determination of bearing capacity of shallow foundations.

Unit-4: Safety factors in foundation design, eccentrically loaded footings, Settlement considerations, Raft foundation- bearing capacity and design principle.

Unit-5: Pile foundation-types and uses, cast in situ pile construction, pile load capacity-static and dynamic formulae.

Unit-6: Pile load test, correlation with penetration test data, group action of piles, negative skin friction, settlement computations.

Unit-7: Well and Cassion foundation, construction and sinking of a well; Sheet Pile Walls & Bulk Heads.

Unit-8 Arching in soils and braced cuts; Ground improvement techniques, deep compaction, soil reinforcement. Introduction to air photo interpretation.

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of load transfer mechanism from super structure through foundation. In the end of the course the

student will be able to understand bearing capacity assessment, selection of deep or shallow foundation system according to super structure and type of soil.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2 & Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-8 and around 30% from coverage of Test-2
Assignment	10 Marks	25 Marks
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Geotechnical Engineering by C. Venkatramaiah, New Age International Private Limited; Fifth edition (2017)
2. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher Dist. (2020)
3. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering, by V. N. S. Murthy, Crc Press (2010)
4. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New Age International Pvt Ltd; Third edition (2016)

REFERENCE BOOKS:

1. Geotechnical Engineering by Sahashi K. Gulhati, Manoj Datta, McGraw Hill Education (2017)
2. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri, John Wiley & Sons Inc; 3rd edition (1996)
3. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning (2002)
4. Soil Mechanics by T. William Lambe and Robert V. Whitman, Wiley India Pvt Ltd (2012).

Course Description

Title: Steel Structure Design
L-T-P scheme:3-0-0

Code: CE114
Credits: 3

Prerequisite: Structural Analysis – I& II

Objectives:

1. To learn the fundamentals of bolted and welded connections
2. To learn the design of tension and compression members beams and beam columns
3. To learn the design of built up members and column base

Learning Outcomes:

Course Outcome	Description
CO1	Outline the properties of structural steel and its properties.
CO2	Describe structural member joints through riveting, bolting and welding.
CO3	Develop the concepts of compression, tension and flexural member design.
CO4	Identify structural steel behaviour under different types of loading.
CO5	Apply the concept of axial, bending and shear response for steel structure design.
CO6	Design various structural components for steel structures.

Course Content:

Unit-1:Introduction: Materials and Specification:-Rolled steel section, types of structural steel.

Unit-2:Riveted, welded and bolted connections. Eccentric connection; Design of tension members.

Unit-3:Design of one component, two components and built up compression members under axial load; built up columns under eccentric loading.

Unit-4: Design of lacing and batten plates, Different types of Column Bases- Slab Base, Gusseted Base, and Connection details.

Unit-5:Beams: Permissible stresses in bending, compression and tension. Grillage Foundation.

Unit-6:Design of rolled steel sections, plated beams, simple Beam end connections, beam-Column connections. Plate girders.

Unit-7:Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners.

Unit-8: Web flange splices - Riveted, welded& bolted. Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions.

Teaching Methodology:

In the end of the course the student will be able to design tension and compression members, beams and beam columns and also to design bolted and welded connections with eccentricity.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2 & Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-8 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Comprehensive Design of Steel Structures By Punmia ,
2. Design and Steel Structures by S SBhavikatti,

REFERENCES:

1. Design of steel structures : SK Duggal
2. Steel Structure Design by Alan Williams.

Course Description

Title: Water Resources Engineering
L-T-P scheme: 3-0-0

Code: CE115
Credits: 3

Prerequisite: Students must have already studied courses on ‘Mechanics of Fluid’ and ‘Environmental Sciences’.

Objective:

1. The students will have knowledge of surface hydrology, ground water hydrology, irrigation engineering and river training works.
2. Importance of efficient distribution and stability of water supply canals.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the irrigation systems and command area development programs.
CO2	Describe the groundwater and surface water hydrology.
CO3	Develop the concept of canal irrigation system and river training works.
CO4	Identify the methods to calculate water demand of crops.
CO5	Apply concepts of regime theory for stable channel design.
CO6	Design the canal irrigation systems.

Course Content:

Unit-1: Hydrology; Hydrological cycle, precipitation, snowfall and snowmelt, evaporation, transpiration, depression storage, infiltration, overland flow, stream flow measurements, hydrograph.

Unit-2: Ground water flow; Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, aquitards, radial flow into a well under confined and unconfined conditions, tube wells, pumping and recuperation tests, ground water potential.

Unit-3: Water Resources; Ground and surface water resource, single and multipurpose projects, storage capacity of reservoirs, reservoir losses, and reservoir sedimentation

Unit-4: Irrigation Engineering; Water requirements of crops, Moisture-crop relationship, Irrigation requirements, duty and delta, Irrigation efficiencies, Design of conventional and modern methods of irrigation, Irrigation of arid lands, Salinity of soil, Salinity control, Quality of irrigation water, Contaminants and their effects on various crop types, Rain water management, conjunctive use of water, Water logging causes and control, drainage system design.

Unit-5: Canals; Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributary canals, most efficient section, lined canals, their design, regime theory: Lacey’s theory and Kennedy’s theory, critical shear stress, bed load, local and suspended load transport, cost analysis of lined and unlined canals.

Unit-6: River training; Objectives of river training, methods of river training, river training structures

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Garg, S. K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 1997.
2. Todd, D. K., Ground water Hydrology, John Willey & Sons, New York, 1995
3. Bharat Singh, Fundamentals of Irrigation Engineering, Nem Chand and Brothers, Roorkee

Reference Book:

1. Applied Hydrology - Ven T Chow, David R Maidment, Larry W Mays, McGraw-Hill, New Delhi

Course Description

Title: Structure Analysis-II
L-T-P scheme: 3-0-0

Code: CE307
Credits: 3

Prerequisite: Applied 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 the equilibrium of structure.
CO2	Identify suitable method to solve indeterminate structures.
CO3	Develop the concepts of fixed and moving loads.
CO4	Describe the structural behavior based on the results of analysis.
CO5	Determine the bending moment diagram and shear force diagram of determinate and indeterminate structures.
CO6	Apply the various approaches studied to analyze the real time problem.

Course Content:

Unit-1: Kani's method to analyze simple portal frames

Unit-2: Approximate Methods to analyze portal frames, Rolling loads and Influence lines for beams and arches

Unit-3: Basic Principles of matrix method, Flexibility and Stiffness matrices and their generation

Unit-4: Plastic Analysis of beams and frames

Unit-5: Analysis of Fixed arches, Introduction to MIDAS Civil Software

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 Structure Analysis-II (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Basic structural analysis by C.S Reddy, Prentice Hall of India Pvt. Ltd.
2. Matrix Method of Analysis of Framed structure by Weaver and Gere, CBS Publication
3. Bhavikatti, S.S, Structural Analysis, Vol.1,& 2, Vikas Publishing House Pvt. Ltd., New Delhi 4,2014.
4. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd,New Delhi-4,2014.
5. Vazrani.V.N and Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
6. Pandit G.S.and Gupta S.P., Structural Analysis–A Matrix Approach, Tata McGraw Hill Publishing Company Ltd., 2006

Reference Books:

1. Advanced Structural Analysis with Computer Applications by Ashok K. Jain., Nemchand and Bros, Roorkee Pub.
2. Theory of Structures by B. C. Punamia

Course Description

Title: Theory of structures-I
L-T-P scheme: 3-0-0

Code: CE308
Credits: 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 the structural behavior of various members in a structure.
CO2	Identify suitable method to solve a given problem for any shape of structure for both static and dynamic equilibrium.
CO3	Analyze the results obtained by solving the given problem.
CO4	Describe the structural aspects based on the results of analysis.
CO5	Determine the deflected shape, bending moment diagram and shear force diagram of any structure.
CO6	Apply the various theories to analyze the real time problem.

Course Content:

Unit-1: Types of Structures, Different type of loading and supports, Static and Kinematic Indeterminacy, Displacement due to real work, displacements of Beams, Trusses by Unit Load Method, Displacement due to lack of fit, temperature variation, support movements.

Unit-2: Method of Consistent Deformation (Force Method) for Beams, Frames and Trusses upto two degrees of indeterminacy. Flexibility Coefficients, Redundant Trusses, Effect of Temperature, Lack of Fit, Support Movements, And Least Work Method for Trusses.

Unit-3: Fixed and Continuous Beams: Beams fixed at ends, Beams of varying Cross-Sections, Partially Fixed at Ends. Effect of Settlement of Supports. Three Moment Theorem for Continuous Beams, Beams of Uniform and varying Cross-Sections. Effect of Settlement of Supports.

Unit-4: Influence lines for Beams, Trusses and Arches, Rolling Loads on Bridges - Absolute Maximum Bending Moment

Unit-5: Arches Horizontal Thrust, Radial Shear, Normal Thrust, BMD, Influence Lines for Three Hinged Arches.

Unit-6: Two hinge & three hinge stiffened suspension bridges, I.L.D. for suspension bridges. Grid structures, space 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, UNIT-2
Test-2	25 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6, UNIT-7 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 Theory of structures-I (will be added from time to time):
Digital copy will be available on the JUET server.

Text Book:

1. Basic structural analysis by C.S Reddy, Prentice Hall of India Pvt. Ltd.
2. Matrix Method of Analysis of Framed structure by Weaver and Gere, CBS Publication
3. Bhavikatti, S.S, Structural Analysis, Vol.1, & 2, Vikas Publishing House Pvt.Ltd., New Delhi 4, 2014.
4. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd., New Delhi-4, 2014.
5. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
6. Pandit G.S. and Gupta S.P., Structural Analysis—A Matrix Approach, Tata McGraw Hill Publishing Company Ltd., 2006

Reference Books/Material:

1. Advanced Structural Analysis with Computer Applications by Ashok K. Jain., Nemchand and Bros, Roorkee Pub.
2. Theory of Structures - Vol. I- II by S P Gupta, G S Pandit and R Gupta, Tata McGraw-Hill
3. Theory of Structures by B. C. Punamia

Course Description

Title: Airport and Railway Engineering
L-T-P scheme:3-0-0

Code: CE309
Credits: 3

Prerequisite: Surveying, Highway engineering

Objectives:

1. To learn the fundamentals of railways, airways
2. To plan and design various items of railways and airports

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic history need and planning of railways, general considerations in airport planning
CO2	Describe visual aids, air traffic control and maintenance of airports,the components of permanent way of railways
CO3	Develop various types of heliports and points and crossings of railways
CO4	Identify various types of signals, interlocking, stations and yards, in railways and role of aircraft characteristics in airport planning
CO5	Apply the concepts of design and construction methods for modern railways, airport layout, geometrics and design
CO6	Demonstrate the design, maintenance and drainage of airport, geometric design of railway track

Course Content:

Unit-1: Development of air transport in India, Aircraft characteristics airport planning, Airport site selection, Forecasting in aviation, Environmental considerations. Airport design standards, Runway orientation, Change in direction of runway, Basic runway length,

Unit-2: Geometric design of runways, Geometric standards for taxiway, Exit taxiway design, Terminal lay out & classification.

Unit 3: Airport pavement design, Types of pavements, Design of flexible pavements, Design of rigid pavements. Marking and lighting, Air traffic control, Maintenance of airports

Unit-4: History of railways in India, Engineering Surveys for Track Alignment, Permanent Way and its components, Rails, Concept of Gauges, Coning of Wheels, Creep, Sleepers, Ballast

Unit-5: Geometric Design of Railway Tracks, Gradients and Grade Compensation, Super-Elevation, Widening of Gauge, Transition Curves, Points and Crossings

Unit-6: Design of Turnouts, Signals, Interlocking and Track Circuiting, Lay outs of Railway. Stations and Yards, maintenance of track, track modernization

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of railways and airports. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer. This subject helps a student to learn more practical knowledge and experience in the field of railway engineering and airport engineering as well.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Airport Planning & Design, Khanna. S. K, Neem Chand Publications, Roorkee, (1999)
2. Railway Engineering, Subhash.C.Saxena&Satyapal Arora, Dhanpat Rai & Sons, (1995)

REFERENCES:

1. Planing and design of Airports, Robert Horonjeff, Francis X. Mckelvey, McGraw-Hill Publications
2. Railways, Bridges & Tunnels, Vazirani. V. N, Chandola.S. P, Khanna Publications, New Delhi (1997)

Course Description

Title: Mass Transportation Systems
L-T-P scheme: 3-0-0

Code: CE311
Credits: 3

Prerequisite: Surveying, Highway Engineering

Objectives:

1. To learn the fundamentals of mass transportation systems
2. To plan and design the facilities of mass transportation system in a city

Learning Outcomes:

Course Outcome	Description
CO1	Outline freight transportation, the importance of transportation systems
CO2	Describe physical system components of urban transportation
CO3	Develop Mono rail, bus rapid transit systems and fleet size in cities
CO4	Identify basic guided way systems, different modes and their characteristics, the integration and comparison of different modes
CO5	Apply the overview of mass rapid transit in the design of mass transportation terminals
CO6	Demonstrate Light rail transit, Personal rapid transit, Para transit systems

Unit 1: Modes of transportations, various kinds of public transportation system like bus, bus rapid transit, light rapid transit, railway rapid transit, The evolution and role of urban public transportation modes

Unit 2: Mass transportation systems planning, data collection, trip generation, trip distribution, Mode choice and trip assignment. Important issues of public transport systems, service quality and cost, performance monitoring,

Unit 3: Route and network design, frequency determination, and vehicle and crew scheduling. Effects of pricing policy, finance and operations,

Unit 4: Mass transport system management.

Unit 5: Roles for the public and private sectors, crew scheduling, corridor strategies, Transit signal priority, Real-time control strategies,

Unit 6: Fare policy, Current practices of mass transport systems.

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of mass transportation systems planning and its design as well. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer. This subject helps a student to learn more practical knowledge and experience in the field of mass transportation.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

TEXT BOOKS:

1. Public Transportation Systems, by Daganzo Carlos F, Ouyang Yanfeng, world scientific publication
2. Urban Mass Transportation Planning, by Alan Black, McGraw-Hill Education
3. Planning and Design of Sustainable Urban Transport Systems, By A.K. Jain, Khanna publishers

REFERENCES:

1. Sustainable Mass Transit: Challenges and Opportunities in Urban Public Transportation, by Thomas Abdallah, Elsevier publication.
2. Urban mass transportation abstracts, by Anonymo, University of Michigan Library.
3. Urban mass Transportation Planning and Management, by Stuart Carey, Clanrye International

Course Description

Title: Docks and Harbour Engineering
L-T-P scheme:3-0-0

Code: CE312
Credits: 3

Prerequisite: Surveying, Highway Engineering

Objectives:

1. To learn the fundamentals of water way transportation, planning and design of port and harbour structures.
2. To plan and design the components of docks and harbour

Learning Outcomes:

Course Outcome	Description
CO1	Outline wet docks, dry docks, wind rose diagram and elements of water transportation
CO2	Describe dredgers, and some of case studies of existing ports, types of harbours
CO3	Develop costal protection, green field ports, sea wall and inland port facilities
CO4	Identify different types of lock gates and natural phenomena and layout of port
CO5	Apply the concepts of floating navigational aids, light ships, buoys
CO6	Demonstrate breakwater, jetty, fenders, piers, warves, dolphins, trestle, moles, and off-shore moorings

Course Content:

Unit-1: Historical development of water transportation in India, elements of water transportation, Natural phenomena: Tides, wind, waves, wind rose diagram, currents, beach protection, littoral drift, design wave height.

Unit-2: Docks and harbours: Requirements of port & harbour, site investigations, ship characteristics, Types of harbours, harbour size, harbour depth, turning basin, harbour entrance, Naval hydrographic chart.

Unit-3: Harbour works: Types of breakwater, design of breakwater, jetty, fenders, piers, warves, dolphins, trestle, moles, mooring accessories, off-shore moorings, types of dry docks and design,

Navigational Aids: Types of navigational aids, requirements of signals, light-house, beacon lights, floating navigational aids, light ships, buoys.

Unit-4: Docks and repair facilities: wet docks, dry docks, repair docks, marine railways, lift docks, timber gravity docks, construction of docks, lock gates, pumping plant and slipways. Port facilities: Port development, layout of ports, port planning, port building facilities, transit sheds, warehouses, cargo handling facilities, container handling terminal facilities, cargo carriers, marinas, ship terminals, inland port facilities, Mechanical handling systems.

Unit-5: Dredging: Classification, types of dredgers, selection of dredger, uses of dredged materials, execution of dredging

Unit-6: Costal protection: Coastal erosion and accretion, design of sea wall, revetment, bulkhead

Maintenance and modernization of existing ports

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of docks and harbour planning and its design as well. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer. This subject helps a student to learn more practical knowledge and experience in the field of Docks and Harbour Engineering.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

Text Books:

1. A Course in Docks and Harbour Engineering, S. P. Bindra, Dhanpat Rai and Sons,
2. A course in Docks & Harbour Engineering, Oza and Oza,

References:

1. Docks & harbors, Levison Francis, Clarendon press, (2006)
2. Port Design - Guidelines and recommendations, C. A. Thoresen, Tapir Publications.
3. Design of Marine Facilities for the Berthing, Mooring and Repair of Vessels, J. W. Gaythwaite, Van Nostrand.
4. Planning and Design of Ports and Marine Terminals, Agerschou, H., Lundgren, H., A Wiley-Inter science Publication.
5. Port Engineering, Per brun. Gulf Publishing Co.

Course Description

Title: Foundation Engineering Lab
L-T-P scheme: 0-0-2

Code: CE214
Credit: 1

Prerequisite: Geotechnical Engineering

Objectives:

1. To learn the fundamentals of shear strength of soils
2. To learn swelling and consolidation behavior of soils

Learning Outcomes:

Course Outcome	Description
CO1	Outline the engineering properties of soil.
CO2	Describe shear strength and settlement of soil.
CO3	Develop the understanding of soil exploration methods.
CO4	Identify the shear strength parameters of different types of soil.
CO5	Apply the concepts of load carrying capacity of soil for foundation design.
CO6	Demonstrate shear strength and compressibility of soil under sustained loading.

Laboratory Experiments:

1. Consolidation test
2. Tri-axial compression test
3. Unconfined compression test
4. Direct shear test
5. Vane shear test
6. Swelling pressure test by swelling pressure apparatus
7. Swelling pressure test by consolidometer
8. CBR test (Soaked)
9. CBR test (Unsoaked)
10. SPT test (Demonstration)
11. Plate load test (model)

Teaching Methodology:

This course is introduced to help students to know about the shear strength of soil testing. This course has been divided into eleven units and each section includes the practical exercises to help the students gain more experience about suitability of foundation.

Evaluation Scheme:

Exam		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-5
P-2		15 Marks	Based on Lab Exercises: 6-11
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100	

Learning Resources:

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture& slides available in NPTEL site

TEXT BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New Age International (P) limited publishers
2. Foundation engineering lab manual.

REFERENCE BOOKS:

1. Geotechnical Engineering by Sahashi K. Gulhati, ManojDatta - 2005.
2. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri, Wiley-IEEE, 1996.
3. Principles of Geotechnical Engineering by BrajaM. Das, PWS-KENT Pub. Co. 1990.
4. Soil Mechanics by Lambe and WhitmanWiley edition.

Course Description

Title: Minor Project 2
L-T-P scheme: 0-0-6

Code: CE215
Credits: 3

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

SEVENTH SEMESTER

Course Description

Title: Estimation and Costing

L-T-P scheme: 3-0-0

Code: CE313

Credits: 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 in depth knowledge of professional practice as well the quantity
- Analysis of construction works like, multi-storied structures, Water works & sanitary works, Irrigation works, Road estimates, culverts, etc.

Learning Outcomes:

Course Outcome	Description
CO1	Outline diverse knowledge of estimating, costing and professional practice, which will be use full in tackling real life problems.
CO2	Develop 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: Estimating of buildings: Estimate of walls, building estimate by long-wall short-wall methods, estimate of steps, masonry platform, masonry tank, motor garage.

Unit-2: Estimating of road works: Estimate of earth work by three methods, estimate of pitching of slopes, earthwork of road from L-sections, estimate of earth work in hill road and road having vertical drop, estimate of metalled road.

Unit-3: Estimating of Culverts: Culverts-Methods of estimating, estimate of R.C.C. slab culverts and village road culverts.

Unit-4: Estimating of Bridges: R.C.C. T-beam decking, pier, pipe culverts, R.C.C. T-beam bridge.

Unit-5: Estimating of Wells: Well foundation,

Unit-6: Estimating of Irrigation works: Earth work in canal-different cases, estimate of earth work in irrigation channels, estimate of permanent land, temporary land, estimate of distributary, aqueduct, siphon, fall.

Unit-7: Types of estimates, Estimation through MS- Excel, Introduction to CANDY software.

Unit-8: Estimating of quantities for materials and transport, Specifications, rules and methods of measurement.

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, Unit-4, Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-8 and around 30% from coverage of Test-2
Assignment	10 Marks	25 Marks
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

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

Text Books:

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:

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: Advanced Building Materials

L-T-P scheme: 3-0-0

Code: CE314

Credits: 3

Prerequisite: Building materials and construction

Objective:

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

Learning Outcomes:

Course Outcome	Description
CO1	Outline the various properties and uses of construction materials.
CO2	Describe the behaviour 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: Basics of Micro-structure: Atomic Bonding, Structure of Solids, Movement of Atoms, Development of Microstructure, Material Behavior, Surface Properties, Response to Stress. Thermal Properties, Structural Materials, Review of Construction Materials and Criteria for Selection, Wood and Wood Products, Polymers, Fiber Reinforced Polymers, Metals, Non-structural materials, accessories and finishes, Waterproofing materials, Polymer, Floor Finishes Tiles, Acoustic Treatment, Social Perception of Construction Materials

Unit-2: Fibers in Concrete: Fiber reinforced concrete, Behavior of steel fibers in concrete, Glass fiber reinforced concrete, GFRP in construction, Natural fiber reinforced concrete, Polymer Fiber Reinforced Concrete.

Unit-3: Special Concretes: High strength concrete, Effect of RHA on the properties of HSC, High performance concrete –applications, Self-Compacting Concrete, Concrete made with waste rubber, Special Concretes, Sulfur Concrete, Ferro cement, Geo synthetics, Nano Concrete, Changes in concrete with respect to time.

Unit-4: Corrosion in Concrete: Corrosion in concrete and its protection, Corrosion of re-bars in concrete, Influence of fly ash on the corrosion steel bar in concrete

Unit-5 : Advanced Materials: Adhesives in construction industry-Acrylics, Bridge bearings, Industrial waste materials in concrete Rapid wall panels, Moisture Barriers

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 Advanced Construction materials (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

- 1 Analysis And Performance of Fiber Composites Second Edition B.D. Agrawal and L.J. Broutman A Wiley-Interscience Publication John Wiley and Sons, Inc., New York 449 pages, hard cover, 1990.
- 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 K G, Prentice Hall of India, New Delhi, 1985.

Reference Books:

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-II

L-T-P scheme: 3-0-0

Code: CE315

Credits: 3

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

Objective:

- Be able to analyze some real problem and to formulate the conditions of theory of elasticity application
- Be able to execute a reasonable choice of parameters of the model (geometry, material properties, boundary conditions)
- Be able to analyze the result of solution by standard computational programs

Learning Outcomes:

Course Outcome	Description
CO1	Outline the state of stress and analysis of stresses
CO2	Describe and solve problem of strain analysis
CO3	Develop solution to the problems of the theory of elasticity in practice
CO4	Identify the suitable methods for analysis of a stress and strain
CO5	Apply Equations system of the theory of elasticity and Boundary conditions.
CO6	Understand the different theories of failure.

Course Content:

Unit-1: State of stress in a body. Tensor notations, Differential equations of equilibrium, Invariants of the stress tensor

Unit-2: Theory of strain, Displacement components, strain components and relation between them, Generalised Hooke's law,

Unit-3: Solution of the elasticity problem in terms of displacements, Basic equations of the theory of elasticity, Lamé's equations, Plane problem in Cartesian co-ordinates, Plane problem in polar co-ordinates,

Unit-4: Shrink fits, Rotating disks with uniform thickness, Plate with hole, Torsion in prismatic bars, Saint Venant's method, Solution of torsion problem in terms of stresses Strain energy,

Unit-5: Elastic plastic behavior, Design philosophy, linear elastic and plastic behavior, Tresca and Von Mises yield criteria, Visco-elastic behavior.

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 Theory of Structures -II (will be added from time to time):
Digital copy will be available on the JUET server.

Text Books:

1. Timoshenko and Goadies, "Theory of Elasticity"
2. C.R. Calladine, "Engineering Plasticity" Pergamon press 1969.

Reference Books:

1. Amendeal, "Plasticity Theory and Application" Macmillan 1968
2. Lubliner, "Plasticity Theory"
3. Chakraborti P.K. "Plasticity" TMH

Course Description

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

Code: CE316
Credits: 3

Prerequisite: Nil

Objective:

1. To learn basic principles of wind engineering as applied to civil engineering structures, including boundary layer wind tunnel testing.
2. To be able to compute design wind speeds, mean wind pressures and loads for a typical building using IS code provisions.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic need and significance of wind engineering for design of structures.
CO2	Identify mean velocity and turbulence characteristics in different terrains.
CO3	Describe aerodynamics of bluff bodies and stream lined bodies.
CO4	Develop understanding on concepts of basic and design wind speeds, mean return period, and wind pressure and force coefficients.
CO5	Apply the principles of boundary layer wind tunnel testing and structural dynamics for wind engineering problems.
CO6	Demonstrate estimation of wind pressures/loads on a low-rise building and evaluation of along-wind base moment of a tall building using IS Code provisions.

Course Content:

Unit-1: Basic wind characteristics

Unit-2: Basic bluff body aerodynamics

Unit-3: IS code on wind loads:

Unit-4: Introduction to boundary layer wind tunnel testing

Unit-5 : Structural dynamics as applied to wind engineering

Unit-6: Wind resistant design of structures

Teaching Methodology:

The Course is introduced to the students to gain understanding on basic principles of wind engineering as applied to design of civil engineering structures. After briefly explaining important characteristics of wind in the atmospheric boundary layer, the aerodynamics of bluff and stream lined bodies are discussed. Methods of computation of design wind speed, wind pressure and loads as per IS code provisions are explained. Basic concepts of boundary layer wind tunnel testing are covered to emphasize the importance of experimental methods. Subsequent two chapters briefly include basic principles of structural dynamics and Davenport's gust factor method for computing along-wind response of a tall building.

Evaluation Scheme:

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

Learning Resources:

Lecture slides on Web Development (will be added from time to time)

Reference Books:

- [1] Holmes J.D., Wind Loading of Structures, 2001, Spon Press, New York.
- [2] Dyrbye,C. and Hansen,S.O., Wind loads on structures, John Wiley & Sons, 1996.
- [3] Simiu E. and Scanlan RH. Wind effects on structures, 3rd ed., 1996; Wiley-Interscience, New York.
- [4] Taranath, B.S., Reinforced concrete design of tall buildings, First Indian Reprint 2011,Taylor and Francis Group, New York.
- [5] Cook,N.J., (1985)The Designer's Guide to wind loadings of buildings and structures, Parts 1 and 2., Butterworth Publishers, London.
- [6] Lawson., T.V., (1980),Wind Effects on Buildings, Vol. 1 and 2., Applied Science Publishers, Essex, London.
- [7] Indian Standard, IS:875(Part 3)-2015, "Code of practice for design loads (other than earthquake) for buildings and structures, Part 3, Wind Loads, Bureau of Indian Standards, New Delhi.
- [8] Yunus A. Cengel, and John M. Cimbala,2006, Fluid Mechanics – Fundamentals and Applications, Tata McGraw Hill publishers, New Delhi.
- [9] R.J. Garde, 1997, 2nd edition, Fluid mechanics through Problems, New Age International Publishers, New Delhi.
- [10] Anil K. Chopra, Dynamics of structures, Prentice Hall of India, (P) Ltd., New Delhi, 2007.
- [11] Pankaj Agarwal, and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India, (P) Ltd., New Delhi, 2007
- [12] William T. Thomson, Marie Dillon Dahleh and ChandramouliPadmanabhan, Theory of Vibrations with applications, Dorling Kindersley (India) Pvt Ltd., New Delhi, 2008.

Course Description

Title: Urban Transportation planning & Design
L-T-P scheme:3-0-0

Code: CE317
Credits: 3

Prerequisite: Surveying, Highway Engineering

Objectives:

1. To learn the fundamentals of urban transportation planning based on various models.
2. To understand the urban transportation problems and planning process.

Learning Outcomes:

Course Outcome	Description
CO1	Outline modal split and capacity-restrained traffic assignment
CO2	Describe the development of transport systems in the cities
CO3	Develop the conceptual aspects of transport planning process
CO4	Identify various methods of trip distribution
CO5	Apply trip generation analysis and trip distribution methods on road networks
CO6	Demonstrate roadside-Interview technique, cordon-line and post-card surveys

Course Content:

Unit-1: Introduction: Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation and Future developments. Urban Transportation System Planning: Conceptual Aspects, Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation, Sequence of Activities Involved in Transport analysis.

Unit-2: Trip Generation Analysis: Trip Production Analysis, Category Analysis, Trip Attraction Modeling, Mode Choice Modeling, Influencing Factors, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit Model, Model calibration, Case studies.

Unit-3: Trip Distribution Analysis: Presentation of Trip-Distribution Data, PA Matrix to O-D Matrix, Gravity Model of Trip Distribution, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models, Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, Disadvantage of Growth Factor Method.

Unit-4: Route Assignment: Description of transport network, Route Choice behavior. The minimum Path, Route Assignment Techniques, Multipath traffic Assignment, Capacity-Restrained Traffic Assignment. Transportation Surveys: Definition of Study Area, Zoning, Types of movements,

Unit-5: Types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey,

Cordon-Line Survey, Post-Card questionnaire Survey, Registration-Number Survey, Tag-on-Vehicle Survey.

Unit-6Transport Related Land-Use Models: Development of Land - Use models, The Lowry Model, Application of Lowry Model. Transport economics, cost and benefits. Transport systems planning

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of transportation planning of any city. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer. This subject helps a student to learn more practical knowledge and experience in the field of city transportation planning.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Principles of Urban Transport Systems Planning, B.G. Hutchinson, McGraw-Hill Book Co., New York, 1974.
2. Traffic Engineering and Transport Planning, L.R. Kadiyali, KhannaPublishers,New Delhi, 2000.

REFERENCES:

1. Modelling Transport, . J. de D. Ortuzar and L.G. Willumsen, John Wiley and Sons,2001.
2. Transportation Engineering andPlanning, C. S. Papacostas and P. D. Prevedouros,Prentice Hall of India Pvt. Ltd., 2001

Course Description

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

Code: CE318
Credits: 3

Prerequisite: Fluid mechanics.

Objective: The objective of this course is to provide graduates with in-depth knowledge of hydropower plants and its generation.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the sources of energy
CO2	Describe the types of hydropower plants
CO3	Develop the concepts of water conduction system
CO4	Identify the various hydraulic structures for hydropower plants
CO5	Apply the principles of impact of jet and velocity triangles to turbines
CO6	Understand the intake structures, penstocks, surge tanks and small hydropower plants

Course content:

Unit-1: Introduction: Sources and forms of energy, types of power plants, historical perspective of hydropower development, hydropower development in India and world, hydropower potential, constraints in hydro power development, general arrangement of a hydroelectric project.

Unit-2: Hydropower plants classification: Surface and underground power stations, low, medium and high head plants, layout and components, storage plants, diversion or run-of-river system, pumped storage plants, tidal power plants, micro tidal units, scale of hydro power projects, Load and power studies: Nature of power demand or load, load curve, load factor, capacity factor, utilization factor, load duration curve, firm power and secondary power.

Unit-3: Intake structures: Components of intake, factor affecting the layout function and types of intakes, energy losses at intake, trash rock, spacing of bars, air entrainment at intakes, inlet aeration.

Unit-4: Penstocks and power canals: Classification of penstocks, design of penstocks, economic diameter, bends, anchor blocks, surges in canals, design criteria of power canals.

Unit-5: Surge tanks: functions, location & arrangement of surge tank, types of surge tanks, hydraulic design, design of simple surge tank-stability.

Unit-6: Hydraulic turbines: Types and classification, main components of turbines, efficiency of a turbine, constructional features, selection criteria, characteristic curves, governing of turbines specific speed, draft tubes-types, draft tube theory, cavitation in turbines, unit quantities.

Unit-7: Small hydropower development: Benefits and potential of small hydropower plants, components of small hydropower plants, trench weir, desilting tank.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and Unit-2
Test-2	25 Marks	Based on Unit-3, Unit-4 and Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 and Unit-7 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Water Power Engineering: M.M.Dandekar and K.N.SharmaVikas Pub. House, New Delhi.
2. Fluid Mechanics and Hydraulics Machines, R. K. Bansal, Laxmi Publication, New Delhi
3. Handbook of Hydro Electric Engineering, P. S. Nigam, Nem Chand and Bros. Roorkee.

Reference Books:

1. Water Power Development: Mosony, E., Vol. 1, 2 (A, B), Third Ed., Akademiai Kiado, Budapest, 1987.
2. Hydroelectric Handbook: William P. Creager and Joel D. Justin, 2nd Edition. Published by Wiley, Newyork.
3. Handbook of Applied Hydraulics: Davis, 4th Edition, McGraw-Hill, Newyork.
4. Hydropower Structures: R.S.Varshney, Nem Chand and Bros. Roorkee
5. Water Power Engineering: M. M. Deshmukh, Dhanpat Rai and Sons.

Course Description

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

Code: CE319
Credits: 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 given member.
CO3	Develop the detailing concepts of structures.
CO4	Identify the permissible limits for design of 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, Overhead and Underground Water Tanks.

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 Special Reinforced Concrete Structures (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

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:

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: Rock Mechanics

L-T-P scheme:3-0-0

Code: CE320

Credits: 3

Prerequisite: Geotechnical Engineering

Objectives:

1. To learn the Classification of Rocks
2. To understand the engineering properties of rocks and rock-masses

Learning Outcomes:

Course Outcome	Description
CO1	Outline Rock mass classification
CO2	Describe Strength, Modulus and stress strain response of rocks
CO3	Develop Estimation of stresses in rock mass
CO4	Identify Strength behaviour of rock mass.
CO5	Apply to tunnel construction and excavation
CO6	Demonstrate the failure criterion of rock

Course Content:

Unit-1: Historical development of rock mechanics. Basic equations from solid mechanics, distribution of rocks on Indian mainland, stereographic presentation of geological data

Unit-2: Laboratory testing of rocks, strength, modulus and stress-strain responses of rocks.

Unit-3: Engineering classification of rock and rock masses. In situ geophysical methods, electrical resistivity methods for ground characterization

Unit-4: Deformability tests in rock mass, field shear test & permeability tests.

Unit-5: Estimation of stresses in rock mass, stability of rock slopes, rock foundations.

Unit-6: Methods to improve rock mass responses. Tunneling Technology

Teaching Methodology:

This course is introduced to help students to analyze the differences and similarities between soil and rock mechanics and it will also help the students to evaluate the design parameters for structures such as tunnels, caverns, dam foundations.

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-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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

3. Engineering in Rock Masses, by Bell FG (1992): Butterworth-Heinemann Ltd, Oxford
4. Introduction to Rock Mechanics, 2nd Edition, by Goodman RE (1989): Chapman and Hall, London

REFERENCES:

7. Rock Slope Engineering, Institution of Mining and Metallurgy, by Hoek E. and Bray JW (1977): London
8. Engineering Rock Mechanics, Part-2 (Illustrative Worked Examples), by Harrison JP and Hudson JA (2000): Elsevier, oxford
3. Engineering In Rocks For Slopes, Foundations and Tunnels, by T. Ramamurthy (2010): PHI learning private limited

Course Description

Title: Environmental Management & Impact Assessment
L-T-P scheme: 3-0-0

Code: CE321
Credits: 3

Prerequisite: Nil

Objective: To learn about environment and its management, and environmental audit and impact assessment of civil engineering projects.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the environmental problems arising due to engineering and technological activities.
CO2	Describe the population - economic growth, energy requirement and demand.
CO3	Develop the objectives of the EIA studies
CO4	Identify the methodology to prepare rapid EIA
CO5	Apply EIA and environmental management plans for future
CO6	Understand the major pollutants and abatement devices for environmental management and sustainable development.

Course content:

Unit-1:Environmental management :Environment; Definition and elements - Interaction between abiotic and biotic elements Human interference with the environment -Resource exploitation and use of technology Impact of man, technology on environment - Exploitation and destruction Environmental degradation - current environmental concerns.

Unit-2:Concept of environmental management - Conservation, preservation and sustainable development Environmental impact assessment.

Unit-3:Introduction to environmental impact assessment - Frame work of Environmental Assessment, prediction and assessment of impact on the air, water, biological & socioeconomic environment – methodologies of EIA

Unit-4: Future Environmental impact assessment - Some specific studies on environmental impact assessment of certain projects: Hydropower project, highway project, cement manufacturing.

Unit-5:Environmental audit: Introduction - Types of Audits - Features of Effective auditing - programme Planning - Definition - Organization of Auditing Programme - pre visit data collection Audit Protocol - Onsite Audit - Data Sampling - Inspections - Evaluation and presentation Audit Report.

Unit-6:Various environmental management systems.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

1. Man and Environment D.H. Carson 1976 Interactions Part I and III.
2. Renewable Energy Environment and Development, Maheswar Dayal Konark Publishers Pvt.Ltd.
3. Energy sources Resources and options M N Sastri Himalaya Publishing House, 1992.
4. Energy for a sustainable world, J.Goldenbery, T.B.Johanson, Amulya K.Reddy & Robert Williams, Wiley Eastern Ltd., 1993
5. Cahill LB Environmental Audits, Govt. Industries
6. Center for Science and Environment (1997), The State of India's Environment 1984-85 Reprints. CSE, New Delhi.

Reference Books:

1. Canter, L.W., "Environmental Impact Assessment ", McGraw Hill, New York, 1997.
2. Petts, J., "Handbook of Environmental Impact Assessment Vol. I and II ", Blackwell Science, London, 1999.
3. The World Bank Group, "Environmental Assessment Sourcebook Vol. I, II and III ", The World Bank, Washington, 1991.
4. Paul L Bishop (2000) " Pollution Prevention: Fundamentals and Practice ", McGraw-Hill International.
5. World Bank Group (1998) "Pollution Prevention and Abatement Handbook "Towards Cleaner Production", World Bank and UNEP, Washington D.C.
6. Prasad modak, C.Visvanathan and Mandarparasnis (1995) "Cleaner Production Audit", Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok.
7. Young, S.S., "Environmental audit-REM 1994", cahner publishing co.

Course Description

Title: Geo-environmental Engineering
L-T-P scheme: 3-0-0

Code: CE322
Credits: 3

Prerequisite: Water supply engineering

Objective: To develop the in depth knowledge for design of water and wastewater treatment plants.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the awareness and Pollutant Characterization in the field of Geo-Environmental Engineering.
CO2	Describe the disposal and transport of contaminants for pollutant stabilization.
CO3	Develop the concepts for design of treatment plants
CO4	Identify the testing methods for characterization and identification of contaminated ground soil.
CO5	Apply rational approach to evaluate and remediate contaminated sites
CO6	Understand the design of low cost treatment systems

Course content:

Unit-1: Soil- Pollutant Interaction: Introduction to geo environmental engineering, environmental cycle, sources, production and classification of waste, causes of soil pollution, factors governing soil-pollutant interaction, physicochemical behavior, failures of foundations due to pollutants

Unit-2: Characterization, Stabilization and Disposal, Safe disposal of waste, site selection for landfills, characterization of land fill sites, waste characterization stability of landfills, current practice of waste disposal, passive contaminant system, hazardous waste control and storage system, mechanism of stabilization, solidification of wastes, micro and macro encapsulation, absorption, adsorption, precipitation, detoxification, organic and inorganic stabilization.

Unit-3: Transport of Contaminants: Contaminant transport in sub surface, advection, diffusion, dispersion, governing equations contaminant transformation, sorption, biodegradation, ion exchange, precipitation, hydrological consideration in land fill design, ground water pollution, bearing capacity of compacted fills, pollution of aquifers by mixing of liquid waste, protecting aquifers.

Unit-4: Detection and Testing Methods, Methodology, review of current soil testing concepts, proposed approach for characterization and identification of contaminated ground soil for engineering purposes.

Unit-5: Remediation of Contaminated Soils: Rational approach to evaluate and remediate contaminated sites, monitored natural attenuation, exsitu and insitu remediation, solidification, bio-remediation, incineration, soil washing, electro kinetics, soil heating, verification, bio venting, ground water remediation, pump and treat, air sparging, reactive well application of geo synthetics in solid waste management - rigid or flexible liners.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2 and Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 and 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text books:

1. Sewage Disposal and Air Pollution Engineering by S.K. Garg, Khanna Publishers.
2. Water Supply, Waste disposal and Environmental pollution engineering by A.K. Chatterjee, Khanna publishers.
3. Manual on “Sewerage and Sewage Treatment”, CPHEEO, Ministry of Urban Development, GOI, New Delhi.
4. Reddi L.N and Inyang HI (2000) Geoenvironmental Engineering: Principles and Applications, Marcel Dekker Inc Publication

Reference books:

1. Design of Wastewater Treatment, - S.R. Quasim, CBS Publications, U.S.A.
2. Environmental Engineering by Peavy, Rowe and Tchobanoglous, McGraw-Hill international editions.

3. Wastewater Engineering - Treatment, Disposal, and Reuse - Metcalf & Eddy, McGraw-Hill Publishing Company Limited.
4. Fundamentals of Geoenvironmental Engineering by Abdel-Mohsen Onsy Mohamed Evan Paleologos, Elsevier publishers.
5. Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies by Hari D. Sharma and Krishna R. Reddy, Wiley publishers.

Course Description

Title: Pre-stressed Concrete Structure
L-T-P scheme:3-0-0

Code: CE323
Credits: 3

Prerequisite: Structural Analysis, Design of Concrete Structures

Objective:

Develop professional level competence in the design of commonly used prestressed concrete structures.

Learning Outcomes:

Course Outcome	Description
CO1	Outline of the methods of pre-stressing and the materials used.
CO2	Identify the governing factors for design of pre-stressed member.
CO3	Analyze a pre-stressed concrete section and estimate the losses.
CO4	Describe the flexural and shear properties of pre-stressed members.
CO5	Determine the dimension and design values for pre and post tensioned beams.
CO6	Apply the concepts of pre-stressing in the design of structural elements.

Course Content:

Unit-1: Introduction to basic concept of pre-stressing, System of pre-stressing

Unit-2: Loss of pre-stress,

Unit-3: Analysis for flexure, Design for flexure shear and torsion,

Unit-4: Deflection and cracking consideration,

Transmission of pre-stress,

Unit-5: Precast elements: poles, railway sleepers, beams, slab, use of relevant codes of practice. Introduction to design of pre-stressed bridges

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 Pre-stressed Concrete Structures (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Pre-Stressed Concrete by Krishna Raju, TMH

Reference Books:

1. Pre-Stressed Concrete, by Pandit & Gupta, CBS
2. Design of Pre-stressed Concrete Structures, by T.Y. Lin, Asia Publishing House, 1955.
3. Pre-Stressed Concrete: A Fundamental Approach, by Edward Nawy, prentice hall, New Jersey

Course Description

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

Code: CE324
Credits: 3

Prerequisite: Mechanics of Fluid

Objective: To develop the in depth knowledge of various hydraulic structures and their design

Learning Outcomes:

Course Outcome	Description
CO1	Outline the Diversion Head Works
CO2	Describe the theories of failure of hydraulic structures founded on pervious foundations
CO3	Develop the concepts of various storage works
CO4	Identify the control concepts of spillways
CO5	Apply principles of fluid mechanics to design of dams
CO6	Understand the maintenance of hydraulic structures

Course content:

Unit-1: Diversion Head Works; Weirs and Barrages - Layout of a diversion Head work and its components

Unit-2: Failures of hydraulic structures founded on pervious foundations - creep theory for seepage flow (Bligh's Lacey's and Khosla's)

Unit-3: Storage works; Design of gravity dams: modes of failure and criteria for structural stability of gravity dams - Diversion problems in dam - construction of Galleries - joints - foundation treatment –

Unit-4: Types of earthen dams - methods of construction - Causes of failure of earthen dams, Seepage Analysis - seepage control in Earthen dams.

Unit-5: Spillways; Spillway types, control concepts, overflow, side channels, shaft and siphon spillways, chutes, cavitations, aeration

Unit-6: Maintenance of Hydraulic structures; Types, procedure, charts, Annual maintenance.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text books:

1. Irrigation Engineering and Hydraulic Structures, by Garg, S.K., Khanna Publishers, 1997.
2. Irrigation Engineering and Hydraulic Structures, by Sahasrabudhe, S.R., Katson Publishers, 1994.

Reference book:

1. Punmia, B.C., Irrigation and Water Power Engineering, Lakshmi Publications, Delhi.

Course Description

Title: Science of Open Channel Flow

L-T-P Scheme: 2-0-0

Course Code: CE337

Course Credits: 2

Prerequisite: Fluid Mechanics

Objective:

1. The students will have knowledge of concepts of channel hydraulics, surface hydrology and river training works.
2. To gain proficiency in applying the conservation equations to open channel flow problems.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic knowledge of open channel flow relationships by applying fluid properties.
CO2	Describe the open channel flow equations from the basic conservation equations
CO3	Develop the concept of specific energy relationships for hydraulic jumps, surges, and critical, uniform and gradually-varying flows.
CO4	Identify the methods to calculate economical channel design required for water distribution.
CO5	Apply concepts to flow measurement using various theories.
CO6	Understand the overall hydrology and river training works for stable channel design.

Course Content:

Unit-1: Introduction to free surface flows, Comparison between pipe and channel flows, Basic equations governing channel flows.

Unit-2: Uniform Flow: Flow resistance in channel flows, Resistance relationships, Normal depth, Section factor for uniform flow computation,

Unit-3: Concepts of specific energy and specific force, section factor for critical flow computation, Critical depth computations, Control sections, Applications of specific energy and critical depth, Types of hydraulic jump, Hydraulic jump in horizontal rectangular channels, Forced Jump, Hydraulic Jump in non-rectangular and sloping channels, stilling basins.

Unit-4: Gradually Varied Flow: Governing equations, Characteristics and classification of water surface profiles, Computation of GVF profiles in prismatic and non-prismatic channels.

Unit-3: Design of Channels: Most efficient cross-section in rigid boundary channels, Incipient motion condition, Regimes of flow and Resistance to flow in mobile bed channels, Non- scouring erodible boundary channel design, Alluvial channel design, uniform flow in mobile bed channels,

Unit-6: Flow measurement in open channels: Broad and sharp-crested weirs, Free overall, Flow over spillways, Side weirs, Sluice gates.

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text Books:

- 1.“Flow Through Open Channels” by Ranga Raju K.G., Tata McGraw-Hill Publishing Company Limited, New Delhi 2003.
- 2.“Open Channel Hydraulics” by Chow, V.T., Mc Graw Hill Book Company, 1959
- 3.“Flow of Fluids in Pipes and Channels” by Asawa, G.L., CBS Publishers, New Delhi 2007

Course Description

Title: Major Project Part-1
L-T-P scheme: 0-0-8

Code: CE216
Credits: 4

Prerequisite: Students must have already studied the basic courses of CE and have explored the various dimensions for its application in Civil Engineering projects.

Objective:

1. Students will be able to identify/formulate project problem for B. Tech. project.
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 write dissertation/thesis after completion of the work for the degrees of B. Tech.

Learning Outcomes:

Course Outcome	Description
CO1	Interpret data from research papers
CO2	Analyze related work to his/her area
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

EIGHTH SEMESTER

Course Description

Title: Dam and Reservoir Design

Code: CE325

L-T-P scheme: 3-0-0

Credits: 3

Prerequisite: Mechanics of fluid, Water Resources Engineering.

Objective: The objective of this course is to give the students the basics concept of planning and investigation of dam site; design and analysis of different types of dams.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the planning and environmental aspects of dam projects.
CO2	Describe the classification, physical factors and economics of selection of type of dam.
CO3	Develop the method analysis of forces acting on dam
CO4	Identify the suitability of dam types based on different factors.
CO5	Apply the principle of stability analysis based on reservoir capacity
CO6	Understand the stability of dam foundation.

Course content:

Unit-1: Planning of project, Purpose of development, Project study, Ecological and environmental considerations, Flood studies, Economic considerations.

Unit-2: Selection of type of dam, Classification of types, Physical factor governing selection of type, legal, economic, aesthetic considerations.

Unit-3: Foundation and construction materials: Investigation, Source of information, Surface exploration, sampling, Field and laboratory tests.

Unit-4: Earth fill dam: Origin, Selection of type, Design principles, Foundation design, Embankments, Embankment details

Unit-5: Rock fill dam: Origin and usage, Definition and types, Foundation design, Embankment design, Membrane design

Unit-6: Concrete gravity dam: Introduction, Origin and development, Forces acting on dam, Requirements for stability, Dams on pervious foundations

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text books:

1. Irrigation Engineering and Hydraulic Structures, by Garg, S.K., Khanna Publishers, 1997.
2. Irrigation Engineering and Hydraulic Structures, by Sahasrabudhe, S.R., Katson Publishers, 1994.
3. Embankment Dam Engineering, by Singh B., and Varshney R. S., Nem Chand & Bros. Roorkee.

Reference books:

1. Design of small dams - Bureau of Reclamation USA- Oxford & IBH, New Delhi

Course Description

Title: Underground Technology
L-T-P scheme: 3-0-0

Code: CE326
Credits: 3

Prerequisite: Geotechnical Engineering

Objectives:

1. To learn the fundamentals for earthwork and basement constructions
2. To learn the side support systems along with methods of lowering of water table
3. To evaluate the design parameters for underground structures

Learning Outcomes:

Course Outcome	Description
CO1	Outline Underground construction methodology.
CO2	Describe problems associated with underground construction.
CO3	Develop soil support systems and lowering of water table.
CO4	Identify the problems associated with underground excavations.
CO5	Apply Underground construction management.
CO6	Demonstrate Underground construction and ground improvement techniques.

Course Content:

Unit-1: Introduction to various underground structures.

Unit-2: Underground construction methodology & equipments, Excavations, soil support methods, diaphragm walls.

Unit-3: Management of groundwater, dewatering methods, Cofferdams, Caisson & wells.

Unit-4: Methods of Basement construction, Grouting.

Unit-5: In-situ Densification: Preloading, Compaction Grouting, Dynamic Compaction, Blast densification, Vibro-Compaction and Vibro-Replacement.

Unit-6: Compaction piles, Reinforcement of embankments and foundations, Tunnels: Introduction, Tunnel stabilization and lining.

Unit-7: Cut and Cover Tunnels, Bored Tunnels, Immersed Tube Tunnels, Water Conveyance Tunnels, Micro-tunnels.

Unit-8: Underground Conduits: Ditch Conduits, Positive Projecting Conduits, Negative Projecting Conduits, Imperfect Ditch Conduits, Tunneled Conduits.

Teaching Methodology:

The main objective of this course is to understand the underground construction methodology and the remedial measures for the problems associated with the underground construction. The course will also help to understand the methods of ground improvement techniques as per the requirement.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2 & Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-8 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

Text Books:

1. Geotechnical Engineering by Gulati & Dutta (TMH)

References:

- Construction Technology by Roy Chudley& Roger Green
- Advanced Construction Technology by Roy Chudley& Roger Green
- Tunnel Engineering Handbook edited by Bickel, Kuesel and King (624.193 BIC)
- Railway Bridges and Tunnels by Vazirani and Chandola (625.1 VAZ)

Course Description

Title: Advanced Pavement Design

L-T-P scheme: 3-0-0

Code: CE327

Credits: 3

Prerequisite: Highway Engineering

Objectives:

1. To learn the fundamentals for designing of highway and to implement them for developing a computer based system.
2. To design the highways by using latest design techniques.

Learning Outcomes:

Course Outcome	Description
CO1	Outline highway pavement materials and cement concrete mixes
CO2	Describe different types of overlays and modified binders
CO3	Develop white topping system of roads, tie bar and dowel bar systems in roads
CO4	Identify various types of Joint filling & sealing materials used in roads
CO5	Apply layered system concepts like Burmister and other methods
CO6	Demonstrate marshal method of mix design and IRC methods of pavement design

Course Content:

Unit-1: Highway materials; Sub grade soils, special problems in soil stabilization works, stone aggregates, bituminous materials

Unit-2: Bituminous paving Mixes, Design of bituminous mixes by marshal method

Unit-3: Flexible pavements: Layered system concept, California Resistance value or stabilometer method triaxial test method, McLeod method, Burmister method, IRC: 37 method.

Unit-4: Rigid pavements: design parameters, modulus of sub grade reaction, stresses calculation, design of slab, IRC:58 method, Dowel bars and tie bars in pavements as reinforcement, types of joints,

Unit-5: Joint sealing materials, Modified binders, Cement concrete Mixes, Overlays: Pavement strengthening problems, types of overlays, advantages of Cement concrete overlays over bituminous overlays, white topping, overlay design, IRC:81 method.

Unit-6: Joint filling & sealing, pre stressed concrete pavements, Influence charts

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of highway pavement materials and pavement design as well. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more practical experience as a designer. This subject helps a student to learn more practical knowledge and experience in the field of pavement design. Furthermore student gain knowledge on various advanced highway materials. The student may gain field knowledge also in collecting data for pavement design.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Principles of pavement design: by Yoder E.J. Published by John Wiley and Sons, USA
2. Highway Engineering by 'A.K.Justo&S.K.Khanna' Nemchand Publ. Roorkee.

REFERENCES:

1. Highway design and construction RJ Salter - 1988 - Basingstoke: Macmillan
2. Highway Design and Construction Bruce, Arthur, International Textbook Co
3. Flexibility in Highway Design Garvey, Jane F., Acting Federal Highway Administrator
4. IRC:37 -2012 ,Guidelines for the design of flexible pavements.
5. IRC:58 -2011 ,Guidelines for the design of plain jointed rigid pavements for highways
6. IRC:81-1997, Guidelines for strengthen of flexible road pavements using Benkelman beam deflection technique.

Course Description

Title: Highway Construction, Maintenance and Management
L-T-P scheme:3-0-0

Code: CE328
Credits: 3

Prerequisite: Highway Engineering

Objectives:

1. To learn the fundamentals of highway materials and highway construction methods.
2. To know the knowledge about quality control, highway maintenances and its management

Learning Outcomes:

Course Outcome	Description
CO1	Outline the equipments, methods, data collection and limitations due to weather
CO2	Describe soil stabilization , joints, overlays and transport economics
CO3	Develop various suitable techniques for recycling of pavements and hill roads and detailed project report and drawings
CO4	Identify suitable materials for sub grade, sub base, base, wearing courses as per IRC and MORT& H
CO5	Apply the concepts of maintenance and management of roads
CO6	Demonstrate the construction procedure of embankments, bituminous, concrete roads and their quality control at the time of construction as per IRC codes

Course Content:

Unit-1: History of road construction, equipments for the road construction, stages of construction, data collection as per IRC codes, limitations in construction due to weather. Earthwork: Clearing and grubbing, excavation, embankment construction, replacement of soils, soil stabilization.

Unit-2: Non bituminous pavement constructions: granular sub base, base. water bound macadam roads

Unit-3: Bituminous pavement construction: Sub grade, granular sub base, base course, binder course, wearing coat, interlayer coats, Cement concrete pavement: Dry lean concrete, laying of concrete pavement, concrete surfacing, joints in cement concrete pavement

Unit-4: Highway maintenance: General, distress in pavements, cracking, patching, rutting, pot holes and their repair

Unit-5: Evaluation of pavement, overlays, pavement maintenance, Introduction to transport economics:

Unit-6: Recycling of pavements, construction of hill roads, drainage, Quality control tests during construction, detailed project report and drawings

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge on highway materials, highway construction techniques, maintenance and its management of as well. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer. This subject helps a student to learn more practical knowledge and experience in the field of

highway construction according to IRC and MORT&H specifications. Additionally student will gain sound knowledge on quality control techniques in highways.

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 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:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

TEXT BOOKS:

1. Highway Engineering By S.K.Khanna and C E Justo
2. Principles and practices of Highway engg, L.R.Kadyali&N.B.Lal, , Khanna Publishers, Delhi (2006)

REFERENCES:

1. Principles of transportation Engineering ByPartha Chakraborty and A. Das
2. Specification of road and bridge works by Ministry of Shipping, Road Transport & Highways.

Course Description

Title: Design of Water and Wastewater Treatment Plants
L-T-P scheme: 3-0-0

Code: CE329
Credits: 3

Prerequisite: Water supply engineering

Objective: To develop the in depth knowledge for design of water and wastewater treatment plants.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the Unit operations and processes in water and waste water treatment.
CO2	Describe the Sedimentation, Coagulation, flocculation and filtration of water
CO3	Develop the concepts for design of treatment plants
CO4	Identify the Preliminary and Primary, Secondary and Tertiary Treatment of waste water.
CO5	Apply principles of fluid mechanics to design of treatment units
CO6	Understand the design of low cost waste water treatment systems

Course content:

Unit-1:Water treatment: Unit operations and processes.

Unit-2:Sedimentation: Design of primary and secondary sedimentation tank, Settling and removal efficiency for discrete and flocculent settling. Coagulation: coagulants and their reactions, determination of optimum dose of coagulant, design of rapid mix chamber. Flocculation, hydraulic and mechanical flocculators and their design, criteria for good flocculation..

Unit-3:Filtration: Design of slow sand and rapid sand introduction to dual media filters and mixed media filters. Disinfection: disinfectants, chlorination and practices of chlorination. Water softening by lime soda process and ion exchange; calculation of dosage of chemicals. Design of water treatment plant.

Unit-4:Wastewater Treatment: Unit operations and processes. Preliminary and Primary treatment: screens, grit chamber and their design, sedimentation and chemical precipitation.

Unit-5: Secondary Treatment: Activated Sludge Process, aeration tanks, design of activated sludge units & modifications, trickling filters, theory and design using NRC equation. Anaerobic digestion of sludge, design of anaerobic digesters.

Unit-6:Tertiary Treatment: Introduction to microstraining, adsorption on activated carbon,

solvent extraction, ion exchange, reverse osmosis, electro-dialysis, ammonia stripping, nitrification and de-nitrification, biological phosphorus removal, advanced biological systems, chemical oxidation, design of low cost waste water treatment systems. Design of complete wastewater treatment plant

Teaching Methodology: The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 and 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 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:

Lectures notes, Tutorials, slides (will be added from time to time), Digital copy will be available on the JUET server.

Text books:

1. Water Supply Engineering by S.K. Garg, Khanna publishers.
2. Sewage Disposal and Air Pollution Engineering by S.K. Garg, Khanna Publishers.
3. Water Supply, Waste disposal and Environmental pollution engineering by A.K. Chatterjee, Khanna publishers.
4. Manual on "Water Supply and Treatment ", CPHEEO, Ministry of Urban Development, GOI, New Delhi.

Reference books:

1. Design of Wastewater Treatment, - S.R. Quasim, CBS Publications, U.S.A.
2. Environmental Engineering by Peavy, Rowe and Tchobanoglous, McGraw-Hill international editions.
3. Wastewater Engineering - Treatment, Disposal, and Reuse - Metcalf & Eddy, McGraw-Hill Publishing Company Limited.

Course Description

Title: Earthquake Resistant Structures
L-T-P scheme:3-0-0

Code: CE330
Credits: 3

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

Objective:

1. Introduce the basic concepts in dynamic as well as 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 Earthquake.
CO2	Identify various structural systems on the basis of 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 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, Case study: analysis and design of a multistory R/C frame

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

Text Books:

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:

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: Advanced Foundation Engineering
L-T-P scheme: 3-0-0

Code: CE331
Credits: 3

Prerequisite: Foundation Engineering

Objectives:

1. To assess the bearing capacity of expansive, layered and newly filled soils
2. To provide a knowledge of the design of raft and machine foundations

Learning Outcomes:

Course Outcome	Description
CO1	Outline foundations on layered, sanitary landfills and residual soil.
CO2	Describe anisotropic soil behavior under footing.
CO3	Develop the concept of foundation design on soil with variable conditions.
CO4	Identify the methods for assessment of bearing capacity and settlements on layered soils.
CO5	Apply the suitability of various types of foundations with an anisotropic soil profile.
CO6	Demonstrate the load transfer mechanism and compressibility.

Course Content:

Unit-1: Bearing capacity from field tests data, bearing capacity for footings on layered soils, on slopes.

Unit-2: Bearing capacity of foundations with uplift or tension force; proportioning of footings.

Unit-3: Stresses and displacements in layered and anisotropic soils.

Unit-4: Foundations on difficult soils - residuals soils, sanitary landfills and geo-environmental considerations.

Unit-5: Special footings and beams on elastic foundation, Design of raft foundation by flexible methods.

Unit-6: Design of Piles for resisting uplifts, and laterally loaded piles; Settlement of pile groups.

Unit-7: Design of foundations for vibration control, analysis and design of machine foundations.

Unit-8: Computational methods in Geo-mechanics, Introduction to forensic geotechnical engineering.

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of bearing capacity based on field test data and the design of shallow & deep foundation for difficult soils. This subject helps a student to learn more practical knowledge and experience in the field of geotechnical engineering.

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 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-8 and around 30% from coverage of Test-2
Assignment	10 Marks	25 Marks
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Regular class notes, tutorials, study material, videos, and expert lecture& slides available in NPTEL site.

Text Books:

1. Foundation analysis and design by Joseph E. Bowles, 5th Edition, McGraw-Hill
2. Foundation engineering handbook by Winter and Fang
3. Geotechnical Engineering by Coduto
4. Foundation Engineering by Tang

Reference Books:

1. Soil Mechanics by Lambe and Whitman, Wiley edition
2. Geotechnical and Foundation Engineering: Design and Construction by Robert W. Day, McGraw – Hills
3. Design Aids in Soil Mechanics and Foundation Engineering by Kaniraj, Shenbaga R. Kaniraj -1988
4. Foundation Engineering In Difficult Ground by Frederic Gladstone Bell – 1978
5. Foundation Engineering For Difficult Subsoil Conditions by Leonardo Zeevaert – 1983
6. Principles of Foundation Engineering by Braja M. Das.

Course Description

Course Name: Introduction to Sustainability

L-T-P: 3-0-0

Code: CE332

Credits: 3

Prerequisite: Nil

Objective:

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

Learning Outcomes:

Sustainable Construction	
CO1	Outline the concepts and principles of sustainability.
CO2	Identify ecosystems, Extinctions and climate change.
CO3	Analyze sources of contamination challenges in water and waste management.
CO4	Describe the sources of contamination and related consumption in agriculture.
CO5	Determine the environmental policy assessment in the present scenario and its impact.
CO6	Apply the concepts of sustainability metrics to Socio-economic feasibility.

Course Content:

Unit 1: Introduction - Fundamentals of Sustainable approach- Sustainability and resources, present practices at national and international level.

Unit 2: Ecosystems and Climate Change - Ecosystems and Extinctions, weather versus climate, climate change in the past and modern climate change.

Unit 3: Energy – Energy Overview, various energy sources, renewable energy sources, energy conservation.

Unit 4: Water Management – Water conservation, sources of contamination, challenges in water management.

Unit 5: Waste Management – Municipal waste, Plastic waste, Industrial waste, Recycling, Reuse and Management.

Unit 6: Environmental policy - Environmental Policy, Introduction to EIA, Environmental Policy Assessment and life cycle assessment, case studies.

Unit 7: Measuring Sustainability - Sustainability Metrics and Future Aspects, Socio-economic feasibility of sustainable products.

Teaching Methodology:

- At the start of course, the course delivery pattern 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 and Unit-3
Test-2	25 Marks	Based on Unit-4, Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 and Unit-7 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 sustainability 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. Green Development - Environment and Sustainability in a Developing World by Bill Adams. Taylor & Francis, 2008.
2. Environment and Sustainable Development by M. H. Fulekar, Bhawana Pathak and R K Kale. Springer, 2013.
3. UN website (sdgs.un.org)
4. <http://www.siesiem.edu.in>
5. <https://www.teriin.org/>
6. <https://www.iisd.org/>

Course Description

Title: Remote Sensing and GIS
L-T-P scheme: 3-0-0

Code: CE333
Credits: 3

Prerequisite: Surveying

Objective: To provide exposure to the students on various techniques of remote sensing.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the remote sensing and GIS applications in civil engineering.
CO2	Describe the process of data acquisition of satellite images and their characteristics.
CO3	Develop the concept of geographical information system model with remote sensing data.
CO4	Identify the image visually and digitally with digital image processing techniques.
CO5	Apply the problem specific remote sensing data for civil engineering applications
CO6	Demonstrate and explain the concepts and fundamentals of GIS.

Course Content:

Unit-1: Remote Sensing: System, data acquisition and processing; Applications; Multi concept in remote sensing. Physical basis of remote sensing - Electro-magnetic radiation (EMR) - nature, nomenclature and radiation laws; Interaction in atmosphere - nature, its effects in various wavelength regions

Unit-2: Atmospheric windows; Interaction at ground surface - soils and rocks, vegetation, water, etc

Unit-3: Geometric basis of interaction. Platform and sensors - Terrestrial, aerial and space platforms; Orbital characteristics of space platforms, sun & geo-synchronous;

Unit-4: Sensor systems radiometers, opto-mechanical and push broom sensor; Resolution - spectral, spatial, radiometric and temporal; Data products from various air and space borne sensors - aerial photographs, LiDAR, Landsat, SPOT, IRS, ERS, IKONOS, etc. Image interpretation- Elements of interpretation; Manual and digital interpretation; Field verification.

Unit-5:Geographical Information Systems: Components of GIS- data acquisition, spatial and attribute data, pre-processing, storage and management; Data structures-raster and vector data; GIS analysis functions; Errors and corrections; Data presentation and generation of thematic maps; GIS applications

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 Remote sensing and GIS (will be added from time to time):
Digital copy will be available on the JUET server.

Text Books:

1. Advanced Surveying: Total Station, GIS and Remote Sensing by SatheeshGopi, Gopi Pearson Education India, 2007
2. Advanced Surveying and Mapping by George Dewey Whitmore

Reference Book:

1. Advanced Surveying, Vol 2 by William Horace Rayner

Course Description

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

Code: CE334
Credits: 3

Prerequisite: Nil

Objective:

1. To learn basic principles of wind engineering as applied to civil engineering structures, including boundary layer wind tunnel testing.
2. To be able to compute design wind speeds, mean wind pressures and loads for a typical building using IS code provisions.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic need and significance of wind engineering for design of structures.
CO2	Identify mean velocity and turbulence characteristics in different terrains.
CO3	Describe aerodynamics of bluff bodies and stream lined bodies.
CO4	Develop understanding on concepts of basic and design wind speeds, mean return period, and wind pressure and force coefficients.
CO5	Apply the principles of boundary layer wind tunnel testing and structural dynamics for wind engineering problems.
CO6	Demonstrate estimation of wind pressures/loads on a low-rise building and evaluation of along-wind base moment of a tall building using IS Code provisions.

Course Content:

Unit-1: Basic wind characteristics

Unit-2: Basic bluff body aerodynamics

Unit-3: IS code on wind loads:

Unit-4: Introduction to boundary layer wind tunnel testing

Unit-5 : Structural dynamics as applied to wind engineering

Unit-6: Wind resistant design of structures

Teaching Methodology:

The Course is introduced to the students to gain understanding on basic principles of wind engineering as applied to design of civil engineering structures. After briefly explaining important characteristics of wind in the atmospheric boundary layer, the aerodynamics of bluff and stream lined bodies are discussed. Methods of computation of design wind speed, wind pressure and loads as per IS code provisions are explained. Basic concepts of boundary layer wind tunnel testing are covered to emphasize the importance of experimental methods. Subsequent two chapters briefly include basic principles of structural dynamics and Davenport's gust factor method for computing along-wind response of a tall building.

Evaluation Scheme:

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

Learning Resources:

Lecture slides on Web Development (will be added from time to time)

Text Books:

1. Holmes J.D., Wind Loading of Structures, 2001, Spon Press, New York.
2. Dyrbye, C. and Hansen, S.O., Wind loads on structures, John Wiley & Sons, 1996.
3. Simiu E. and Scanlan R.H. Wind effects on structures, 3rd ed., 1996; Wiley-Interscience, New York.
4. Taranath, B.S., Reinforced concrete design of tall buildings, First Indian Reprint 2011, Taylor and Francis Group, New York.
5. Cook, N.J., (1985) The Designer's Guide to wind loadings of buildings and structures, Parts 1 and 2., Butterworth Publishers, London.
6. Lawson, T.V., (1980), Wind Effects on Buildings, Vol. 1 and 2., Applied Science Publishers, Essex, London.
7. Indian Standard, IS:875(Part 3)-2015, "Code of practice for design loads (other than earthquake) for buildings and structures, Part 3, Wind Loads, Bureau of Indian Standards, New Delhi.

Reference Books:

1. Yunus A. Cengel, and John M. Cimbala, 2006, Fluid Mechanics – Fundamentals and Applications, Tata McGraw Hill publishers, New Delhi.
2. R.J. Garde, 1997, 2nd edition, Fluid mechanics through Problems, New Age International Publishers, New Delhi.
3. Anil K. Chopra, Dynamics of structures, Prentice Hall of India, (P) Ltd., New Delhi, 2007.
4. Pankaj Agarwal, and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India, (P) Ltd., New Delhi, 2007
5. William T. Thomson, Marie Dillon Dahleh and Chandramouli Padmanabhan, Theory of Vibrations with applications, Dorling Kindersley (India) Pvt Ltd., New Delhi, 2008.

Course Description

Title: Introduction to Disaster Management
L-T-P scheme:3-0-0

Code: CE335
Credits: 3

Prerequisite:

Objective:

This course is intended for an introductory-level understanding of the concepts underpinning, and practical processes involved in, the management of disasters.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the causes of hazards, disasters and associated natural/social phenomenon
CO2	Identify the disaster management theory.
CO3	Analyze different existing global frameworks and agreements.
CO4	Describe methods of community involvement as an essential part of successful disaster risk reduction.
CO5	Enumerate technological innovations in disaster risk reduction and discuss their advantages and problems
CO6	Design independent Disaster Management study including data search, analysis and presentation of disaster case study.

Course Content:

Unit-1: Overview of Disaster Management: Introduction, Disaster Management Cycle,

Unit-2: Education and Public Awareness, The Role of Media in Disaster Management, Disaster Associated Health Issues

Unit-3: Physical and Socio-economic Impacts of Disasters, Vulnerable Groups in Disasters

Unit-4: The Role of Technology in Disaster Management, Geographic Information Systems (GIS) and Global Positioning System (GPS) in Disaster Management , Remote Sensing and Disaster Management , Early warning systems

Unit-5: Natural Hazards: causes, distribution pattern, consequences and mitigation measures for: Earthquake, Tsunami , Cyclone, Flood, Drought, Landslide

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 Disaster Management and Mitigation (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. A Manual on Disaster Management. By Parag Diwan (2010). Pentagon press ISBN: 978-81-8274 438-7 Disaster Management & Rehabilitation, by Rajdeep Dasgupta (2007): Mittal Publication. ISBN 81-8324-201-4
2. S. Disaster management by K. Singh & Shobha Singh (1998). Mittal publication. ISBN 81-7099-679-8 (Vol. 5)

Reference Books:

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

Web References:

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

Journals References:

- [5] Journal of Earthquake Engineering
- [6] Journal of structural Engineering
- [7] Journal of seismology
- [8] 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 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

Course Name: Infrastructure and Health Monitoring
L-T-P scheme: 3-0-0

Code: CE336
Credits: 3

Prerequisite: Basic concrete technology.

Objective:

The objective of this course is to know the basic importance of infrastructure in the development of the country, the basic needs of construction of infrastructure, codal provisions and testing procedure followed in the health monitoring of the infrastructure.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the materials required for constructing infrastructure.
CO2	Develop the concept of safety and health of various types of infrastructure
CO3	Describe the various types of surveys and techniques followed in the construction industry.
CO4	Identify the suitability methods for treatment of sewage and for municipal water supply
CO5	Demonstrate the basic transportation modes and its characteristics.
CO6	Apply the concepts water resources structures in the daily life of society

Course Content:

Unit-1: Introduction, development of civil infrastructure, role of infrastructure in the development of country, engineering materials used in construction

Unit-2: Codal provisions, types of loads, testing of materials, town planning and municipal rules, Sub structure, superstructure, elements of a building, load bearing and framed structures, lightning, fire safety, sound proofing

Unit-3: Classification of soils, types of foundations, bearing capacity, stabilization and ground improvement techniques. Water intake structures, water supply demands, pre and post treatment methods of drinking and sewage water

Unit-4: Various modes of transportation, classification of highways, traffic control, carriageway, construction methods, IRC provisions, Evaluation of pavements, expressways, components of railway track, types of stations, airport planning, types of runways, heliports, airport lighting, air traffic control, basic components of docks and harbor.

Unit-5: Introduction to water resource projects, runoff, pumps, types of dams, canals, reservoirs, regulators, flow measuring devices, interlinking of rivers, failure of dams, instruments used in different types of surveys, GIS, GPS

Unit-6: Destructive and Non destructive testing of infrastructure, maintenance of infrastructure, cost benefit analysis of infrastructure projects, Health monitoring of infrastructure projects and sustainability aspects, green building techniques, codal provisions.

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, and Unit-2
Test-2	25 Marks	Based on Unit-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:

Tutorials and lecture slides on infrastructure and health monitoring (will be added from time to time): will be available on the JUET server.

Text Books:

1. 'A Text Book of soil mechanics and foundation engineering " by B.C.Punmia.
2. "A text book on Highway Engineering", by S.K.Khanna and Arora, Neem chand publishers
3. "A Text Book of Engineering Materials", by Kulkarni, C. J., Ahmedabad Book Depot, Ahmedabad, 1968.
4. "A Text Book of water supply and sewage ", by S.K.Garg
5. A text book of surveying" B.C. Punmia.
6. A text book of structural engineering by S. Ramamrutham.

Reference Books:

1. "IS:456:2000, A code of practice for plain and reinforced cement concrete
2. Traffic engineering by L.R.Kadiyali
3. Open chanel flow by Subramanyam

Course Description

Title: Major Project Part-2
L-T-P scheme: 0-0-16

Code: CE218
Credits: 8

Prerequisite: Students must have already studied the basic courses of CE and have explored the various dimensions for its application in Civil Engineering projects.

Objective:

1. Students will be able to identify/formulate project problem for B. Tech. project.
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 write dissertation/thesis after completion of the work for the degrees of B. Tech.

Learning Outcomes:

Course Outcome	Description
CO1	Interpret data from research papers
CO2	Analyze related work to his/her area
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

Specialization Courses

Course Description

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

Code: CE351
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, HepingXie, 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: CE352
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: CE353
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	Analyze 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: CE354
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: CE355
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: CE356
Credits: 3

Prerequisite:

Objective:

The Construction Financial Management course teaches an all-important skill when it comes to construction and development. In this course, students will learn 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: Concrete Technology
L-T-P scheme: 3-0-0

Code: CE361
Credits: 3

Prerequisite: Building Materials and Construction

Objective: The objective of this course is to acquaint the student with knowledge about various ingredients used in concrete.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the properties of various ingredients of concrete.
CO2	Identify suitable concreting ingredients.
CO3	Analyze the suitability of admixtures in concrete.
CO4	Describe the behavior of concrete at micro and macro level.
CO5	Determine the mix design suitable for a given condition.
CO6	Apply the concepts of concrete technology.

Course Content:

Unit- I: Introduction to concrete, its components and use, Hydraulic cements: Manufacturing, emissions, composition, types, hydration and microstructural development of Portland cements; Special hydraulic cements

Unit-II: Aggregates: Properties, types of aggregates, classification of aggregates, testing of aggregates, effects of aggregates on concrete properties, lightweight aggregates, recycled aggregates, quality control of water.

Unit-III: Admixtures: Chemical admixtures: Water reducers, superplasticizers, accelerators, retarders, air entraining admixtures, Mineral additives: Slags, fly ashes, rice husk ash, metakaolin, calcined clays, silica fume, limestone powder

Unit IV: Mix design of concrete: Concept of Mix design, variables in proportioning, various methods of mix design, roles of water to cement ratio, chemical admixtures, mineral additives, concrete mix design through IS:10262-2019, self compacting concrete, high strength and high performance concrete.

Unit V: Testing of concrete: Properties of fresh concrete: Workability, rheology, shrinkage, bleeding, test methods, Properties of hardened concrete, Non-destructive testing and repair of concrete, Quality in practice: provisions of IS456

Unit VI: Durability of concrete: Mass transport in concrete, carbonation, chloride ingress, sulphate attack, salt attack, frost, salt scaling, alkali silica reaction, repair, Cracking: Chemical shrinkage, autogenous shrinkage, drying shrinkage, plastic shrinkage, thermal cracking.

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 Concrete Technology (will be added from time to time):
Digital copy will be available on the Juet server.

Text Books:

1. HFW Taylor, Cement Chemistry, Thomas Telford, 1997
2. Bensted J. and Barnes P. (Ed.), "Structure and Performance of Cements", Second Edition, Spon Press, 2002

Reference Books:

1. P.K. Mehta and P.J.M. Monteiro, "Concrete Microstructure, Properties and Materials", Third Edition, Tata McGraw Hill 2006
2. A.M. Neville and J.J. Brooks, "Concrete Technology", Pearson Education Ltd. 1987.

3. Jähren P. and Tongbo S., Concrete and Sustainability, CRC Press, 2014
4. Sarja A. and Vesikari, E., Durability Design of Concrete Structures E & FN Spon. 1996.
5. Brandt, A. M., Cement-Based Composites: Materials, Mechanical Properties and Performance, E & FN SPON. 1995
6. Bentur, A. and Mindes, S., Fibre Reinforced Cementitious Composites, E & FN Spon 1990

Course Description

Title: Concrete Technology Lab
L-T-P scheme: 0-0-2

Code: CE402
Credits: 1

Prerequisite: Concrete Technology

Objective: To understand the effect of ingredients of concrete in its structural behavior.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the fundamental effects of ingredients of concrete in its behavior.
CO2	Identify the various factors affecting the strength of concrete.
CO3	Analyze the results of various tests in concrete.
CO4	Describe the significance of tests of fresh and hardened concrete.
CO5	Enumerate the step-by-step procedure of different tests as per Indian standard codes.
CO6	Apply the concepts of codal provisions to the mix design.

Course Content:

Unit-1: Specific surface area of Cement by Blaine's Apparatus

Unit-2: Soundness test of cement by Autoclave method

Unit-3: Soundness test of coarse aggregates

Unit-4: Lime reactivity test

Unit-5: Marsh cone test and drying shrinkage by length comparator

Unit-6: Workability test of self compacting concrete

Unit-7: Modulus of Elasticity of Concrete

Unit-8: Concepts of Mix Design of concrete

Unit-9: Split and Flexural strength of concrete

Unit-10: Permeability of concrete

Unit-11: Sorptivity test of concrete

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of testing of concrete and its ingredients. This course has been divided into ten units and each section includes theory and practical exercises to help a student gain more experience in concrete technology. This theory course is well complemented by a theory course under the name 'concrete technology' in the same semester that helps a student to learn more practical knowledge and field experience.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Lab Exercises: 1-5
P-2	15 Marks	Based on Lab Exercises: 6-11

Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		100 Marks	

Learning Resources:

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

Textbooks:

1. Concrete Technology by M. S.Shetty, S.Chand Publishing
2. Concrete Technology by M.L.Gambhir, McGraw Hill Publication

Course Description

Title: Numerical Techniques In Civil Engineering
L-T-P scheme: 3-0-0

Code: CE362
Credits: 3

Prerequisite: Engineering Mathematics

Objective: The objective of this course is to acquaint the student with knowledge about various mathematical techniques to solve any civil engineering problem.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various mathematical techniques to solve any civil engineering problem.
CO2	Identify suitable mathematical technique to solve a given problem.
CO3	Analyze the given structural engineering problem using available techniques.
CO4	Describe the structural behavior based on the mathematical outcome obtained through analysis.
CO5	Determine the solution to structural problem in hand through numerical techniques.
CO6	Apply the concepts of numerical techniques to solve real life problems.

Course Content:

Unit 1: Fundamentals of numerical methods; Error analysis; Approximation in Numerical Computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic. Interpolation: Difference Operator: Forward and Backward, Shift Operator, Newton forward interpolation, Newton backward interpolation, Lagrange's Interpolation, Curve fitting; Interpolation and extrapolation. Applications to civil engineering problems

Unit 2: Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Weddle's Rule, Expression for corresponding error terms. Numerical Solution of Ordinary Differential Equation: Taylor series method, Euler's method, Euler's modified method, fourth order Runge-Kutta method and Milne's Predictor-Corrector methods. Numerical solution of partial differential equation: Finite Difference method, Crank– Nicolson method. Applications to civil engineering problems

Unit 3: Solution of nonlinear algebraic and transcendental equations; Applications to civil engineering problems.

Unit 4: Elements of matrix algebra; Solution of systems of linear equations; Eigen value problems; Solution of differential equations. Computer oriented algorithms; Numerical solution of different problems, Applications to civil engineering problems.

Unit 5: Conventional optimization, Multi-objective Optimization, Fuzzy logic and its extensions, in multi-objective optimization, Multi-criterion Decision Making, Deterministic analysis, Stochastic analysis, Fuzzy analysis, Classification problems, Hybrid approaches in Decision Making, Genetic Algorithms

Unit 6: Introduction to Artificial Intelligence and soft computing; Neural networks: Introduction, models, and its application in civil engineering, fuzzy logic and its application in decision making, Clustering; Introduction to machine learning, case studies

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 numerical methods in civil engineering (will be added from time to time): Digital copy will be available on the JUET server.

Textbooks:

1. Ayyub and McCuen, Numerical Methods for Engineers, Prentice Hall, NJ, 1996.
2. Neural Networks, Fuzzy logic, and Genetic Algorithms Synthesis and Applications; S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI Learning Pvt. Ltd, Delhi

References:

1. Artificial Intelligence A Modern Approach; Stuart J.Russell, Peter Norvig, Third Edition Pearson Education, Inc., India
2. K. E. Atkinson, An Introduction to Numerical Analysis, Wiley, New York, 1989.
3. G. E. Golub and C.F. Van Loan, Matrix Computations, Johns Hopkins University Press, Baltimore, 1989.
4. W. H. Press, S.A. Teukolsky, W.T. Vetterling, B.P. Flannery (Eds.), Numerical Recipes in
5. The Art of Scientific Computing, Cambridge University Press, Cambridge, 1993.
6. B. N. Datta, Numerical Linear Algebra and Applications, Brookes/Cole Publishing Company, Pacific Grove, California, 1995.
7. J.D. Hoffman, Numerical Methods for Engineers and Scientists, Marcel Dekker, New York, 2001

Course Description

Title: Health Monitoring of Structures
L-T-P scheme: 3-0-0

Code: CE363
Credits: 3

Prerequisite: Mechanics of Solids

Objective: The objective of this course is to acquaint the student with knowledge about different types of sensing technology and concepts of health monitoring.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the concepts sensing technology.
CO2	Identify suitable techniques of health monitoring of structures.
CO3	Analyze various stresses present in structures.
CO4	Describe the behavior of structure using sensing technology
CO5	Determine the member forces, stresses and moments in various structures using sensing methods.
CO6	Apply the concepts of Sensing Technology and Structural Health Monitoring to real life problems of mechanics

Course Content:

Unit- I: Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm, piezoelectric sensor, accelerometers.

Unit-II: Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.

Unit-III: Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.

Unit IV: Methodologies and Monitoring Principles, Local & Global Techniques for SHM, Static & Dynamic Field Testing, Short & Long-Term Monitoring, Active & Passive Monitoring. Vibration Based SHM Techniques - Use & Demonstration of Dynamic Properties of Structures for Damage Detection & SHM, Ambient Vibration Test, Acoustic Emission Technique, Electromechanical Impedance Technique, Wave Propagation Based Techniques, Fibre Optics Based Techniques, Remote & Wireless SHM Techniques, IoT Application in SHM, Artificial Intelligence & Machine Learning in SHM.

Unit V: Structural Assessment & Need for retrofitting: Introduction to health assessment of structures, structural damages & failures, Principles of structural assessment, Classification & levels of assessment, Current scenario of infrastructure through case studies.

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 Health Monitoring of Structures (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.
4. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill 1997.

Reference Books:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. A.D. Helfrick and W.D. cooper, Modern Electronic Instrumentation & Measurement Techniques, PHI – 2001
3. Hermann K.P. Neubert, “Instrument Transducers” 2nd Edition 2012, Oxford University Press.

Course Description

Title: Structural Health Monitoring Lab
L-T-P scheme: 0-0-1

Code: CE403
Credits: 1

Prerequisite: Health Monitoring of Structures

Objective: To understand the techniques available for monitoring the health of structures.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the various techniques available health monitoring of structures.
CO2	Identify the suitable technique for health monitoring of a particular structure.
CO3	Analyze the results obtained by various transducers.
CO4	Describe the significance of the different tests for health monitoring.
CO5	Enumerate the step-by-step procedure of different tests.
CO6	Apply the concepts of health monitoring of structures to various real world problems.

Course Content:

Unit-1: Wire strain gauges

Unit-2: Strain measurements in beams using wire strain gauges

Unit-3: Linearly Varying Differential Transducers

Unit-4: Piezoelectric sensors

Unit-5: Thermal Sensors

Unit-6: Pressure Sensors

Unit-7: Half Cell Potential measurements

Unit-8: Rebound Hammer

Unit-9: Rapid Chloride Penetration test

Unit-10: Ultrasonic Pulse Velocity test

Teaching Methodology:

This course is introduced to help students to know about the fundamental knowledge of monitoring the health of structures. This course has been divided into ten units and each section includes theory and practical exercises to help a student gain more experience in structural health monitoring. This theory course is well complemented by a theory course under the name 'Health Monitoring of Structures' in the same semester that helps a student to learn more practical knowledge and field experience.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Lab exercises 1-5
P-2	15 Marks	Based on Lab exercises 6-10

Day-to-Day Work	35 Marks	
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	100 Marks	

Learning Resources:

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

Textbooks:

1. Piezoelectric Materials, Applications in Structural Health Monitoring (SHM), Energy Harvesting and Bio Mechanics by Dr. Suresh Bhalla, Anne Books Pvt. Ltd.

Course Description

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

Code: CE364
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 Special Reinforced Concrete Structures (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: Structural Design and Detailing

L-T-P scheme: 3-0-0

Code: CE365

Credit: 3

Prerequisites: Design of Concrete structures

Objective: To familiarize students with detailing of beams, columns, slabs and other structural elements.

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 OUTLINE:

Unit-1: Introduction: Basics of Detailing, different types of drawing styles; Outline of Drawings

Unit-2: Design drawing and detailing of RC elements / structures – preparation of detailed design documents, Bar bending schedule of structures and reinforcement details (structural drawing) – Slabs, Beams, Columns and Footing,

Unit-3: Design drawing and detailing of special RC elements / structures – Retaining Wall, Water Tanks, Flat slabs, Circular Slabs.

Unit-4: Design and detailing of welded and bolted joints, steel elements / structures - Built-up columns and Column bases, Roof trusses and joints including purlins.

Unit-5: Computer aided analysis and design

- Multi-storey frame analysis for dead, live and wind loads – Applications.
- Design of Reinforced concrete Beams, Columns – Footings – Steel beams – columns – Trusses and Pre Engineered Buildings

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	

TEXT BOOKS / REFERENCES:

1. Design of Reinforced Concrete Structures 1st Edition by N. Subramanian
2. Design of Reinforced Concrete Structures (IS:456-2000) 3rd Edition by N. Krishna Raju
3. Design Of Reinforced Concrete Structures by Ramamrutham
4. Limit State Design of Reinforced Concrete, 2nd Edition by P. C. Varghese
5. D. Krishnamoorthy, "Structural Design & Drawing Vol. I&II", CBS Publishers, 2012.
6. Karve, Shah, "Illustrated Design of R. C. Buildings (G+3)", Standard Publishers Distributors, 2008.
7. SP:34-1987, "Handbook on Concrete Reinforcement and Detailing", BIS.
8. Practical Design of Reinforced Concrete Structures 1st Edition by Ghosh

Course Description

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

Code: CE366
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: Building Planning and Drawing
L-T-P scheme: 3-0-0

Code: CE371
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
3. 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.
5. 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: CE372
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, etc.

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.

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.

Course Description

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

Code: CE373
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 distributaries, 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 Quantity Surveying of Bridges and Hydraulic Structures (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: Construction Contracts and Laws
L-T-P scheme: 3-0-0

Code: CE374
Credits: 3

Prerequisite: Building Materials and Construction

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 Organization", 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: Quality Assurance & Quality Control
L-T-P scheme:3-0-0

Code: CE375
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 Quality Assurance & Quality Control (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: Construction Financial Management
L-T-P scheme: 3-0-0

Code: CE356
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	Outline the theoretical and practical aspects of project management techniques to achieve project goals.
CO2	Identify the organizational and leadership capabilities for effective management of construction projects.
CO3	Analyze the modern construction practices and techniques.
CO4	Describe the necessary knowledge and skills in accounting, financing, risk analysis and contracting.
CO5	Determine the strategies for effective planning, scheduling, executing and controlling of construction projects.
CO6	Apply the advanced technologies and management approaches for the given problem.

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 Construction Financial Management (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: Project Oriented Practice
L-T-P scheme: 0-0-4

Code: CE401
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