### Attendance Sheet

**The list of members of the Board of Studies in Civil Engineering**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Member Details</th>
<th>Committee Designation</th>
<th>Sign</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Pallavi Badry, Head, DCE, VJIT, Hyderabad</td>
<td>Chairperson</td>
<td>Pallavi</td>
</tr>
<tr>
<td>2</td>
<td>Dr. K.M. Lakshmana Rao, Prof. CE, JNTUH, UCEH</td>
<td>University Nominee</td>
<td>KML</td>
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<tr>
<td>3</td>
<td>Dr. N. Darga Kumar, Head, DCE, JNTUH University College of Engineering, Mantham</td>
<td>External Member</td>
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<td>4</td>
<td>Dr. Prabhakar Singh, Head, DCE Mahindra University, Hyderabad</td>
<td>External Member</td>
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<tr>
<td>5</td>
<td>Dr. K. Jagannadh Rao, Professor &amp; Head, DCE, CBIT, Hyderabad</td>
<td>External Member</td>
<td>KJR</td>
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<td>6</td>
<td>Dr. N. Srinivas Rao, Reg. Head, Technical Services, UltraTech Cement, Hyderabad</td>
<td>External Member</td>
<td>NSR</td>
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<td>Dr. S. Srihari, DCE, VJIT, Hyderabad</td>
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<td>Dr. N. Sudharsan, DCE, VJIT, Hyderabad</td>
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<td>9</td>
<td>Dr. Kamalini Devi, DCE, VJIT, Hyderabad</td>
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**Date:** 29/06/2022
Minutes of the BOS meeting in Department of Civil Engineering

Board of studies meeting of the Department of Civil Engineering was held on 29th June 2022 at 11.00 am in the Board’s Room to discuss the following:

The meeting has started with the welcome of all Board of Studies members by the chairman.

Following items are discussed and approved:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Agenda points</th>
<th>Resolutions</th>
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<tbody>
<tr>
<td>1</td>
<td>BOS Agenda Point 1: Approval of B. Tech R21 course structure &amp; syllabi for II, III &amp; IV years</td>
<td>Detailed discussion regarding course structure, course outcomes and syllabi of UG II, III &amp; IV year was held. Proposed course structure and syllabus were approved for R21 by all BOS members for the department of Civil Engineering for the batches admitting from AY 2021-22 onwards. The BOS members discussed in details on minor and honors program offered by civil Engineering department. The proposed course structure and syllabi for both minors and honors program were approved for R21. BOS also approved the SWAYAM/NPTEL/MOOCS courses under each category of program including minor and honors for the batches admitting from AY 2021-22 onwards. BOS approved the course structure of fast track batch for the same regulation.</td>
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<tr>
<td>2</td>
<td>BOS Agenda Point 2: Approval of Minor and Honors Program</td>
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<td>3</td>
<td>BOS Agenda Point 3: Approval of the course structure of the fast track batch for the same regulation</td>
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Signatures:
BOS Agenda Point 4: Open Elective courses for III-I, III-II & IV-I years for R21 Regulation

Detailed discussion regarding open elective courses outcomes and syllabi were held. The BOS members after thorough discussion approved the proposed open elective course offered by Civil Engineering Department for R21 regulations in semesters III-I, III-II & IV-I respectively.

It is approved that chairman is delegated all authority to appoint or change the panel of examiners, paper setters and moderators.

BOS Agenda Point 5: The panel of examiners, paper setters and moderators
## R21 COURSE STRUCTURE FOR REGULAR BATCH

### COURSE STRUCTURE FOR B.TECH I YEAR

**B.Tech I Year I Semester**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Course Category</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
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<tr>
<td>1</td>
<td>BS-1</td>
<td>Mathematics - I</td>
<td>3</td>
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<tr>
<td>4</td>
<td>H &amp; S-1</td>
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<td>6</td>
<td>ES-1</td>
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**Total** | 11 | 2 | 10 | 18 |

**B.Tech I Year II Semester**

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**Total** | 12 | 3 | 10 | 20 |
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## COURSE STRUCTURE FOR B.TECH III YEAR

### B. Tech. III Year I Semester

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<td>H&amp;S-3</td>
<td>Managerial Economics and Financial Analysis</td>
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### B. Tech. III Year II Semester

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# COURSE STRUCTURE FOR B.TECH IV YEAR

## B. Tech. IV Year I Semester

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## B. Tech. IV Year II Semester

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### R21 Course Structure for Fast-Track Batch

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## COURSE STRUCTURE FOR B.TECH VIII YEAR

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**Total** 19 1 4 20
FLUID MECHANICS

B Tech III Year | Semester - CIVIL

Course Outcomes

After completion of this course students will be able to:
- CO1: Understand different properties of fluid and the relationship between them.
- CO2: Explain the Continuity equation for one dimensional, two dimensional and three dimensional flows.
- CO3: Apply the Euler's and Bernoulli's equations in practical civil engineering problems.
- CO4: Analyse head losses in pipes and flow between parallel plates.
- CO5: Demonstrate the boundary layer concepts and its separation.

UNIT - I
Introduction: Dimensions and units. Physical properties of fluids, specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion. Pressure at a point, Pascal's law. Hydrostatic law, atmospheric, gage and vacuum pressure, measurement of pressure. Pressure gauges, Manometers, differential, and Micro Manometers. Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces. Center of pressure; Derivations and problems.

UNIT - II
Fluid kinematics: Description of fluid flow, Stream line, path line, streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows. Equation of continuity for one, two, three dimensional flows. Stream and velocity potential functions; flow net analysis.

UNIT - III

UNIT - IV

UNIT - V

Text Books:

Reference Books:
SOLID MECHANICS - I

B. Tech II Year I Semester - CIVIL

Course Outcomes

After completion of this course students will be able to

1.13 Determine the deflections of beams with various loadings using different methods.

UNIT-I


UNIT-II

Shear Force and Bending Moment: Definition of beams. Types of beams. Concept of shear force and bending moment. S.F. and B.M. diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads. Point of contra flexure. Relation between S.F. B.M. and rate of loading at a section of a beam.

UNIT-III


Shear stresses: Derivation of formula. Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT-IV


UNIT-V


Text Books


Reference Books
ENGINEERING GEOLOGY

**Course Outcomes**

After completion of this course, students will be able to:

C1. Classify and compare different rocks and minerals across the construction site.

C2. Identify and build the knowledge on mafic and felsic common igneous, sedimentary and metamorphic rocks encountered by geologists and engineers.

C3. Define and interpret the geological structures in the geological maps and cross sections.

C4. Understand the importance of geophysical studies and various geophysical methods.

C5. Illustrate the factors which affect the dams, reservoirs and tunnels weathering of common rock like “Granite”.

**UNIT-I**

Introduction: Importance of geology from Civil engineering point of view. Brief study of case histories of failure of some Civil engineering constructions due to geological draw back. Importance of physical properties, Petrology, and structural geology.

Weathering of rocks: Its effect over the properties of rocks. Importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like “Granite”.

**UNIT-II**

Mineralogy: Definition of mineral. Importance of study of minerals. Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of some common rock forming minerals. 
Examples: Feldspar, Quartz, Flint, Jasper, Olivine, Auzite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.


**UNIT-III**

Structural Geology: Out crop, strike and dip study of common geological structures associated with the rocks such as folds, faults, unconformities, and joints - their important types and case studies. Their importance at site of site and their occurrence in India. Stabilization of soils, Ground water. Water table. Common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

**UNIT-IV**

Importance of geophysical studies: Principles of geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radiometric methods and Geothermal methods. Special importance of Electrical resistivity methods and seismic refraction methods. Improvement of competence of sites by ground control etc. Fundamental aspects of rock mechanics and Environmental Geology.

**UNIT-V**

Geology of Dams, Reservoirs and Tunnels: Types of dam and meaning of Geology of site in their selection. Geotechnical considerations in the selection of a site - analysis of dam failures of the past, factor’s contributing to the success of a dam - geological factors influencing water tightness and life of reservoirs - Purposes of tunneling effects of tunneling on the ground role of geological Considerations (e.g., Lithological, structural and ground water) in tunneling over break and lining in tunnels.

**Text Books**

1. 
2. 
3. 
4. 
5. 
6. (not legible)
7. 
8. 
9. (not legible)

Reference Books
Course Outcomes
After completion of this course students will be able to:
1. Identify and describe a detailed surveying at any site by any method.
2. Ability to use modern survey equipment to measure angles and distances.
3. Analyze the working principles of modern equipment and its methodologies.
4. Understand the working principles of modern equipment and its methodologies.
5. Analyze the basic concept of GPS and its applications.

UNIT I
Introduction to surveying: Overview of plane surveying (chain, compass, theodolite and plane table). Objectives, Principles and classifications, Scales, Conventional Symbols, Signals.

UNIT II
Distances and direction: Distance measurement methods, use of chain, tape and electronic distance measurements, meridians, azimuths and bearings, declination, computation of angle.

UNIT III
Leveling and contouring: Concept and Terminology, Temporary adjustments - method of leveling, Characteristics and Uses of contours - methods of conducting contour surveys and their plotting, Embankments and cutting for a level section and two level sections with and without transverse slopes.

UNIT IV
Modern field surveying systems. Principle of electronic distance measurements, types of EDM instruments, distomat, total station - parts of a total station - accessories - advantages and applications, field procedure for total station survey, errors in total station survey.

UNIT V
Introduction to Geomatics: Global positioning systems - segments, GPS measurements, errors in biases, surveying with GPS, Coordinate transformation, accuracy considerations, electromagnetic spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface. Remote sensing data acquisition, platforms and sensors, visual image interpretation, digital image processing.

Text Books:

Reference Books:
SURVEYING & GEOMATICS YEAR

S: Tech II Year I Semester - CIVIL

Course Outcomes

After completion of this course students will be able to:

C.01. Apply the principle of surveying for civil engineering applications
C.02. Apply the knowledge to calculate areas, drawing plans and contour maps using different measuring equipment at field level
C.03. Identify data collection methods and prepare field notes
C.04. Understand the working principles of survey instruments, measurement errors and corrective measures
C.05. Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and its methodologies

List of experiments

1. Survey of an area by chain surveying
2. Determination of two inaccessible points by using prismatic compass
3. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment
4. Radiation & intersection method by plane table survey (Any one exercise)
5. Exercise on BS levelling using dump level
6. An exercise on L.S., C.S and Plotting
7. Traverse, leveling, Heights and distance problem
8. Determination of Area & Remote height using total station
9. Traverse & Contouring using total station
10. Distance, gradient, Dill, Height between two inaccessible points using total station
11. Study on use of GPS for data collection
12. Collection of Point Data, Line Data, and Polygon Data using GPS
Course Outcomes
After completion of this course students will be able to:
CO1: To study the physical properties and identification of minerals referred under the theory.
CO2: Describe and identify the rocks referred under the theory.
CO3: Illustrate the Microscopic study of rocks.
CO4: Interpret and draw the sections for geological maps showing tilted beds, faults, unconformities etc.
CO5: Solve the simple structural geological problems.

List of Experiments
1. Study of physical properties and identification of minerals.
2. Study of physical properties and identification of rocks (igneous).
3. Study of physical properties and identification of rocks (sedimentary).
4. Study of physical properties and identification of rocks (metamorphic).
5. Microscopic study of rocks.
6. Microscopic study of minerals.
7. Study of geological structures like faults and folds.
8. Study of geological structures like tilted bed models and unconformities.
9. Interpretation and drawing of sections for geological maps showing tilted beds.
10. Interpretation and drawing of sections for geological maps showing faults, unconformities.
11. Simple structural geology problems on Strike.
12. Simple structural geology problems on Dip.
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SOLID MECHANICS - II

Course Outcomes

After completion of this course students will be able to

1. Design and safety of the shaft subjected to torsion and bending moment.
2. Calculate the column capacity for various end conditions due to axial and eccentric loading.
3. Apply the concepts of direct and bending stresses to evaluate the safety of Structures.
4. Evaluate the stresses and strains in thin shells and thick cylinders.
5. Determine the stresses due to unsymmetrical bending of beams and locate the shear centre.

UNIT - I


Springs: Introduction - Types of springs - Deflection of close and open coiled helical springs - Under axial pull - Springs in series and parallel.

UNIT - II


UNIT - III

Direct and bending stresses: Stresses under the combined action of direct loading and bending moment, core of a section - Determination of stresses in the case of chimneys, retaining walls and dams - Conditions for stability - Stresses due to direct loading and bending moment about both axes.

UNIT - IV

Thin Shells: Thin seamless cylindrical shells - Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and volumetric strains - Changes in dia. and volume of thin cylinders - Thin spherical shells.

Thick cylinders: Introduction - Lame's theory for thick cylinders - Derivation of Lame's formulae - Distribution of hoop and radial stresses across thickness - Design of thick cylinders - Compound cylinders - Necessary difference of radii for shrinkage.

UNIT - V

Unsymmetrical bending: Introduction - Centroidal principal axes of section - Graphical method for locating principal axes - Moments of inertia referred to any set of rectangular axes - Stresses in beams subjected to unsymmetrical bending - Principal axis - Resolution of bending moment into two rectangular axes through the centroid - Location of neutral axis - Deflection of beams under unsymmetrical bending.

Shear centre: Introduction - Shear centre for symmetrical and unsymmetrical (channel, I, T and L) sections.

Text Books:

Reference Books:
CONCRETE TECHNOLOGY

B Tech II Year II Semester - CIVIL

Course outcomes:
After completion of this course students will be able to:
CO1: Understand the properties of cements and admixtures
CO2: Analyse the properties of aggregates.
CO3: Evaluate the properties of fresh concrete.
CO4: Analyse the behavior of hardened concrete and durability of concrete.
CO5: Design the concrete mix using IS Code and describe the special concretes.

UNIT - I
Admixtures: Types of admixtures - mineral and chemical admixtures

UNIT - II
Aggregates: Classification of aggregate - Particle shape & texture - Bond, strength & other mechanical properties of aggregate - Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate - Bulking of sand - Deleterious substance in aggregate - Soundness of aggregate - Alkaline aggregate reaction - Thermal properties - Sieve analysis - Fineness modulus - Grading curves - Grading of fine & coarse Aggregates - Gap graded aggregate - Maximum aggregate size.

UNIT - III

UNIT - IV

UNIT - V

Text Books

Reference Books:
B Tech II Year II Semester - CIVIL

Course Outcomes
After completion of this course students will be able to
1. Analyze stepped cantilevers.
2. Fixed beams for external loadings and support settlements.
3. Understand the concept of Slope Deflection, Moment Distribution method, and analysis of continuous beams.
4. Draw the influence line diagram for moving loads.

UNIT I
Proposed cantilevers and fixed beams: Determination of static and kinematic indeterminacies for beams. Analysis of proposed cantilever and fixed beams including the beams with different moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying loads, couple and combination of loads. 


UNIT II

Arches: Introduction. Types of Arches. Comparison between Three hinged and Two hinged arches. Linear Arch. Fudge’s theorem. Analysis of Three hinged arches (Circular and parabolic arches without temperature effect and yielding of supports).

UNIT III

UNIT IV
Moving loads and influence lines: Introduction. Maximum SF and BM at a given section and absolute maximum SF and BM due to single concentrated load, UDL load longer than the span, UDL load shorter than the span, two point loads with fixed distance between them and several point loads. Equivalent uniformly distributed load. Fixed length. Definition of influence line for SF, Influence line for BM. Load position for maximum SF at a section, Load position for maximum BM at a section. Point loads UDL, longer than the span, UDL shorter than the span. Influence lines for forces in members of Pratt and Warren trusses. Equivalent uniformly distributed load.

Text Books:

1. Textbook 1
2. Textbook 2
3. Textbook 3
4. Textbook 4
5. Textbook 5
6. Textbook 6
7. Textbook 7
8. Textbook 8
9. Textbook 9

Reference Books:
B Tech II Year II Semester - CIVIL

Course Outcomes

After completion of this course students will be able to

CO1: Identify various building materials and to understand their basic properties.

CO2: Understand the minimum standards required to designate and use the materials in construction.

CO3: Discuss type metals and finishes used in the construction process.

CO4: Understand modern materials in general construction practice.

CO5: Recognize the concept of plastering, pointing and various other building services.

UNIT-I

BULIDING MATERLALSANDCONSTRUCTIONS

UNIT-I

Stones & Bricks: Building stones classifications and quarrying properties structural requirements, Composition of Brick, earth manufacture and structural requirements, classification, Field and laboratory tests on bricks compressive strength, water absorption, efflorescence, dimension and warpage.

Masonry: Definition and terms used in masonry, Brick masonry, characteristics and requirements of good brick masonry. Bonds in brick work, Header, Stretcher, English, Flemish bond, Stone masonry, Requirements of good stone masonry. Classification, characteristics of different stone masonry. Joints in stone masonry. Types of walls, load bearing, partition walls, cavity walls.

UNIT-II


UNIT-III


Paints: Purpose, types, ingredients and defects. Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

UNIT-IV


UNIT-V


Text Books:

Reference Books:

COMPUTER AIDED DRAFTING LAB

B. Tech II Year II Semester – CIVIL

**Course Outcomes**

After completion of this course students will be able to:

CO1: Assess the Software with aiding source.
CO2: Demonstrate the different modes of commands.
CO3: Draft the plan, Elevation & Sectional Views of the building.
CO4: Develop the components of the building.
CO5: Replicate the complete detailing of Building with BIM input.

**List of Experiments**

1. Introduction to concept of drawings through computer aided drafting (CAD)
2. Practice exercises on coordinate system reference planes, initial settings, drawing aids, Presentation norms and standards.
3. Practice Exercises on commands - drafting, Modifying, layers, text, blocks and dimensioning.
6. Drawing of plans of Multi storey buildings with brick thickness (Max G+2)
7. Developing sections and elevations of Single storey buildings.
8. Detailing of different types (any 2 types) of doors and its components by using CAD.
9. Detailing of different types (any 2 types) of windows and its components by using CAD.
10. Exercises on the development of working of building (working drawing) by using CAD.
11. Drawing the complete layout of structure (Educational building).
12. Fundamentals of Building Information Modelling (BIM)
SOLID MECHANICS LAB

II Tech II Year II Semester - CIVIL

Course Outcomes:
After completion of this course students will be able to:
1. Determine the responses under impact, bending, shear and compressive loads.
2. Determine elastic constants by flexural and torsional tests.
3. Determine spring constants under stress-strain curves.
4. Understand the definition of strain, stress, modulus of elasticity, Poisson's ratio.
5. Determine basic material properties under tensile and shear.

List of Experiments:
1. Tension test
2. Bending test on cast iron - Moment of Inertia
3. Bending test on cantilever support beams
4. Torsion test
5. Hardness tests
6. Spring test
7. A compression test on rubber in compression
8. Impact test
9. Shear test
10. Verification of Maxwell's equations on beams
11. Use of electrical resistance wire gauge
12. Continuum beams - Deflection test
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HYDRAULICS & HYDRAULIC MACHINERY

B. Tech III Year I Semester - CIVIL

Course outcomes
After completion of this course students will be able to:

C01: Determine the Froude number for a given flow to differentiate concepts of sub-critical, critical, and super-critical flows.
C02: Compute the non-uniform flow depths for gradually and rapidly varied flow.
C03: Apply dimensional analysis to predict physical parameters that influence the flow in fluid mechanics and use dimensionless parameters.
C04: Compute efficiencies of different types of turbines.
C05: Use performance curves to predict performance of centrifugal pumps.

UNIT I
Open channel flow-I
Introduction: Definition of open channel. Comparison between pipe flow and open-channel flow. Types of open channels. Geometric elements and hydraulic properties of an open channel section. Classification of open-channel flows: steady, unsteady, uniform, non-uniform, gradually varied, rapidly varied, spatially varied.

Uniform Flow: through open channel by Chézy's, Manning's, Kutter's, and Bazin formulae. Computation of normal depth hydraulically efficient channel section.

Critical Flow: Specific energy, critical depth, computation of critical depth, critical, sub-critical, and super critical flows. Alternate depths. Transitions - channel with a hump, and change in width.

UNIT II
Open channel flow-II

Rapidly Varied Flow: Characteristics of RVF. Hydraulic Jump in horizontal rectangular channels - momentum equation formulation for the jump, energy loss. Classification of jumps according to Froude's number. Basic characteristics of the jump - height of jump, length of jump, location of jump.

UNIT III

Modelling and Similitude: Geometric, kinematic, and dynamic similarities. Similarity requirements or modelling laws; model and prototype relations. Definition of distorted and non-distorted models.

UNIT IV


UNIT V
Centrifugal Pumps: Components of a centrifugal pump. Working of a centrifugal pump, classification of pumps. Expression for work done on the impeller, heads of pumps, losses and efficiencies; minimum starting speed. Multistage

Text Books:

Reference Books:
GEOTECHNICAL ENGINEERING

III Year I Semester - CIVIL

Course outcomes
After completion of this course students will be able to:

1. Illustrate the soil formation and classification
2. Explain the stress distribution mechanism and compaction in soil mass
3. Illustrate the mechanism of consolidation
4. Identify the shear strength parameters through analytical and experimental approach

UNIT I

Index properties of soils: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils.

UNIT II


UNIT III

Stress distribution in soils: Boussinesq’s and Westergaard’s theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under a point load along the vertical and horizontal plane.

UNIT IV

UNIT V

Text Books:

Reference Books:

III Year I Semester – CIVIL

Course outcomes
After completion of this course students will be able to:

1. Illustrate the soil formation and classification
2. Explain the Hydrostatic effect in soil mass
3. Illustrate the stress distribution mechanism and compaction in soil mass
4. Illustrate the mechanism of consolidation
5. Identify the Shear strength parameters through analytical and experimental approach

UNIT I

Index properties of soils: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils.

UNIT II


UNIT III

Stress distribution in soils: Boussinesq’s and Westergaard’s theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under a point load along the vertical and horizontal plane.

UNIT IV

UNIT V

Text Books:

Reference Books:
Design of Reinforced Concrete Structures

B. Tech III Year (Semester - Civil)

Course outcome

After completion of this course students will be able to

CO1: Understand the various design concepts and design a beam under flexure and draw the reinforcement details.

CO2: Design the beam under shear and torsion. Calculate the anchorage and development length and check the serviceability requirements for RC structural elements.

CO3: Analyze and solve various RC slabs and draw the reinforcement details.

CO4: Classify short, long columns and draw the reinforcement details.

CO5: Explore the design concept of footing & staircase.

UNIT - I

Design and detailing of beams: Limit state analysis and design of singly reinforced, doubly reinforced, T and I beam sections.

UNIT - II

UNIT - III
Design and detailing of slabs: Design of one way, two way and continuous slabs using IS Codal provisions and coefficients. Cantilever slab / Canopy slab. Introduction to Yield line theory.

UNIT - IV
Design and detailing of short and long columns: Subjected to axial loads, uniaxial and biaxial bending - IS Code provisions.

UNIT - V
Design and detailing of footings and staircase: Different types of footings. Design of isolated, square, rectangular and circular footings - Introduction to combined footings. Design of staircase (dog-legged type).

Text Books:

Reference Books:
2. SP16. Design Aids for Reinforced Concrete to IS 456:1978

Note: IS: 456 2000 and SP16 need to be provided during examination.
**Course outcomes**

After completion of this course students will be able to:

1. Analyze the continuous beams, portal frames by Kani's method.
2. Demonstrate the Indeterminacy of Trusses by Castiglione's second theorem.
3. Evaluate the shear forces and bending moments in Two Hinged arches and to execute secondary stresses due to rise of temperature and Elastic Shortening of rib.
4. Analyze the Multi-storey frames by approximate methods for gravity (vertical) and horizontal loads.
5. Understand the concepts of Matrix method for the analysis of continuous beams and Pin jointed plane frames.

**UNIT - I**

Kani's method: Analysis of continuous beams and portal frames including side sway due to unsymmetrical vertical loading.

**UNIT - II**

Indeterminate Trusses: Analysis of trusses having simple and two degrees of internal and external indeterminacies. Castiglione's second theorem.

**UNIT - III**


**UNIT - IV**


**UNIT - V**


**Text Books:**


**Reference Books:**

Center outcomes
1. Students will be able to identify various building components, conventional signs and symbols.
2. Illustrate the building bye-laws and the principles of planning.
3. Design and detail the plans of various types of buildings and detailing of doors, windows.
4. Understand the elements of perspective drawing involving simple problems.

UNIT - I
Basic components of buildings: Design of various elements of building like various types of footing, open foundation, raft, grillage, pile and well foundation, drawing of frames of doors or windows, various types of door, window, and ventilators, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.
Drawing practice: Sketches of various building components, one drawing sheet of various building components like doors, windows, lintels and arches, stairs, foundation etc.

UNIT - II
Building planning: provision on national building code, building bye-laws, open area, setbacks, FAR terminology, principles of architectural composition (i.e. Unity, contrast etc.), principles of planning orientation.
Drawing practice: one drawing sheet each of buildings and interiors of buildings.

UNIT - III
Building Services - Introduction of building services like water supply and drainage, electrification, ventilation and lighting and staircases, fire safety, thermal insulation, acoustics of buildings.
Drawing practice: Detailed planning of one two-bedroom residential building (One drawing sheet)

UNIT - IV
Design and Drawing of Building: Design and preparation of detailed drawings of various types of buildings like residential buildings, institutional buildings and commercial buildings, detailing of doors, windows, ventilators and staircases.
Drawing practice: Residential building, Institutional buildings (One drawing sheet each)

UNIT - V
Perspective Drawing: Elements of Perspective Drawing involving simple problems, one point and two point perspectives, principles of energy efficient buildings.
Drawing practice: One drawing sheet on each one point and two point perspectives problem.

NOTE
Two periods per week of drawing class should be conducted. The end examination paper should consist of Part A and Part B. Part A should consist of theoretical questions on the syllabus while Part B should consist of 4 questions on drawing out of which 2 to be answered. Weightage for Part A is 60% and Part B is 40%. In exam drawing board should be provided.

Text Books:

Reference Books:
COURSE OUTCOMES
After completion of this course students will be able to CO1: Identify the sources, causes & effects of air pollution.
CO2: Understand the meteorological components and the plume behavior for atmospheric stability conditions.
CO3: Identify the types of equipments to control the particulates at sources.
CO4: Minimize the control measures of NOx, SOx and other gaseous emissions.
CO5: Demonstrate the factors for siting an industry by examining the air quality standards.

UNIT - I
Air Pollution: Definitions, Air Pollution Episodes, Air Pollutants: Classifications - Natural and Artificial - Primary and Secondary, point and Non-Point. Line and Areal Sources of air pollution- stationary and mobile sources. Effects of Airpollutants on man, material and vegetation; Global effects of air pollution - Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT - II

UNIT - III
Control of Particulates: Control at Sources: Raw material changes, Process Changes, Equipment modifications or replacement, Equipment’s: Settling Chambers, Centrifugal separators or cyclones, Fabric filters, Electrostatic precipitators and Wet scrubbers.

UNIT - IV
Control of Gaseous Emissions: Adsorption, Absorption, Combustion, Sox Control technology- Natural dispersion by dilution. Using alternate fuels, removal of sulphur from fuels(Desulphurization), NOx Control technology, NOx control by modification of operating and design conditions- Low Excess air combustion, Decreasing Combustion air temperature, Two stage combustion, Flue gas recirculation.

UNIT - V
Air Pollution Monitoring and Management: Environmental guidelines for siting of industries, Environmental impact assessment, Stack emission standards Ambient air quality standards, air pollution control act. Ambient air quality monitoring: location of stations, Duration of sampling period, SPM sampling, Gaseous sampling.

Text Books:

Reference Books:
Course Outcomes
After completion of this course students will be able to
C01: Demonstrate the engineering properties the soil.
C02: Illustrate the field bulk and dry density of cohesive and cohesionless soils.
C03: Classify the Coarse grained soils based on sieve analysis test & a grain size distribution curve.
C04: Compute the shear strength of cohesive and cohesionless soil.
C05: Determine the permeability of coarse grained soil and fine grained soil by constant head permeability test and falling head method.

List of Experiments
1. Atterberg’s limits
2. Field density - core cutter and sand replacement method
3. Grain size analysis
4. Permeability of soil, constant head test.
5. Permeability of soil variable head test.
6. Compaction test
7. C.B.R test
8. Consolidation test
9. Unconfined compression test
10. Triaxial compression test
11. Direct shear test
12. Vane shear test.
FLUID MECHANICS & HYDRAULIC MACHINERY LAB

B Tech III Year I Semester - CIVIL

Course Outcomes
After completion of this course students will be able to:
CO1: Examine the calibration of different flow meters
CO2: Illustrate flow measuring devices used in pipes, channels and notches.
CO3: Determine minor and major losses in pipes.
CO4: Analyse the energy equation for problems in pipe flow
CO5: Examine the performance characteristics of turbines and pumps.

List of experiments
1. Calibration of venturi meter and orifice meter
2. Determination of coefficient of discharge for a small orifice/mouthpiece by constant head method
3. Calibration of contracted rectangular notch and triangular notch
4. Determination of friction factor of a pipe
5. Determination of coefficient for minor losses.
6. Verification of Bernoulli’s equation.
7. Impact of jet on vanes
8. Study of hydraulic jump
9. Performance test on Pelton wheel turbine
10. Performance test on Kaplan Turbine
11. Performance characteristics of a single stage/multi stage centrifugal pump
12. Performance characteristics of a reciprocating pump

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HIGHWAY ENGINEERING

B.Tech III Year II Semester - CIVIL

Course Outcomes
After completion of this course students will be able to:

CO1: Summarize the road developments in India from different periods.
CO2: Apply the concept of geometric design in real-time engineering.
CO3: Make use of parameters related to traffic studies.
CO4: Design & model the intersections with specific standards.
CO5: Evaluate the different pavement design methods using IRC standards.

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Intersection design: Types of Intersections - Conflicts at Intersections - Requirements of At-Grade Intersections - Types of At-Grade Intersections - Channelized and Unchannelized Intersections - Traffic Islands - Types of Grade Separated Intersections - Rotary Intersection - Concept of Rotary Design - Factors of Rotary Advantages and Limitations of Rotary Intersections.

UNIT-V

Text Books:

Reference Books:
B.Tech III Year II Semester - CIVIL

Course outcomes:
After completion of this course students will be able to:
CO1: Organize the preparation and programme of soil investigation
CO2: Examine the earth pressure theories and stability of retaining walls
CO3: Evaluate the bearing capacity of soil and allowable settlement
CO4: Analyse the capacity and settlement of pile foundation
CO5: Analyse the stability of finite and infinite slopes using various methods

UNIT - I
Soil Exploration:
Need methods of soil exploration, boring and sampling methods, penetration tests, plate load test, pressure meter, planning of soil exploration programme and preparation of soil investigation report.

UNIT - II
Earth pressure theories:
Rankine's theory of earth pressure, earth pressures in layered soils, Coulomb's earth pressure theory.
Retaining walls:
Types of retaining walls, stability of gravity and cantilever retaining walls against overturning, sliding and bearing capacity. Drainage from backfill, introduction to reinforced earth walls.

UNIT - III
Bearing capacity and settlement foundation:
Types of foundation, location and depth, safe bearing capacity, Terzaghi, Mayerhof, Skempton and IS methods, safe bearing pressure based on SPT N value, allowable bearing pressure, safe bearing capacity, allowable settlement of structures, plate load test, allowable settlements of structures.

UNIT - IV
Pile foundation:
Types of piles, load carrying capacity of piles based on static pile formulae, dynamic pile formulae, pile capacity through SPT and CPT results, pile load tests, load carrying capacity of pile groups in sands and clays, settlement of pile groups, negative skin friction.

UNIT - V
Slope stability:

Text books:

References:
UNIT-I
Introduction: Waterborne diseases, protected water supply, population forecasts, design period, types of water demand factors, affecting fluctuations, fire demand, water quality and testing, drinking water standards, sources of water. Comparison from quality, quantity and other considerations in intake, infiltration galleries.

UNIT-II
Layout and general outline of water treatment units: sedimentation principles, design factors, coagulation, flocculation, clarifier design, coagulants, feeding arrangements, Filtration: theory of working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation, comparison of filters, disinfection: theory of chlorination, chlorine demand, other disinfection practices, miscellaneous treatment methods.

UNIT-III
Water distribution systems: Types of layouts of distribution systems, design of distribution system, Hardy cross and equivalent pipe methods, service reservoirs, determination of storage capacities, Conservancy and water carriage systems, sewage and storm water estimation, time of concentration, storm water overflows, combined flow characteristics of sewage examination of sewage, BOD, COD equations.

UNIT-IV
Design of sewers: Hydraulic formulae, Maximum and minimum velocities in sewers, Differences in the design of water supply pipes and sewer pipes, shapes and materials, sewer appurtenances, manholes, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage components, requirements, sanitary fitting, manhole pipe and two pipe systems of plumbing.

UNIT-V
Design of different units: primary sedimentation tank, design of screens, grit chambers, principles and design of biological treatment, trickling filters, activated sludge process, oxidation ditches.

Text books

Reference
WATER RESOURCES ENGINEERING

B Tech III Year II Semester - CIVIL

Course outcomes

After completion of this course, students will be able to:
CO1 Describe the components in the hydrologic cycle and interaction among various processes in the hydrologic cycle.
CO2 Analyse the flood and its measurement by means of hydrograph.
CO3 Analyse the phenomenon of ground water occurrence by means of aquifers.
CO4 Assess the methods of irrigation and its quality with the help of duty delta relationship.
CO5 Design the canals by using standard theories.

UNIT - I

Abstraction from rainfall evaporation: factors affecting evaporation, measurement of evaporation-evapotranspiration, Penman and Baloney methods: infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT - II
Flood measurement and analysis: Distribution of runoff - Hydrograph analysis, flood hydrograph, effective rainfall, base flow, base flow separation - direct runoff hydrograph. Unit hydrograph, definition and limitations of applications of unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph and vice versa. Synthetic unit hydrograph.

UNIT - III
Ground water occurrence: types of aquifers, Aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy's law, Steady radial flow to wells in confined and unconfined aquifer. Types of wells, Well construction, well development.

UNIT - IV

UNIT - V
Canals and its design: Classification of canals, Design of irrigation canals by Kennedy's and Lacey’s theories, balancing depth of cutting, IS standards for a canal design, canal lining.


Text Books:

Reference Books:
Course Outcomes
After completion of this course students will be able to:

CO1: Understand the behavioural aspect of entrepreneurs, various approaches of time management, their strength and weaknesses.

CO2: Apply the concepts of project management techniques.

CO3: Analyze various materials and equipment for construction work.

CO4: Evaluate on different types of contracts and specifications.

CO5: Outline the labour regulations and safety in construction.

UNIT - I
Management Techniques: Roles, Management theories, Social responsibilities, planning and strategic management, strategy implementation, Decision making tools and techniques, Organizational structure, Human resource management - motivation performance - leadership.

UNIT - II

UNIT - III
Resource Management: Resource planning - planning for manpower, materials, costs, equipment, Labour, Scheduling, Resource allocation, Budget and budgetary control methods.

UNIT - IV
Contracts and Tenders: Contract - types of contract, contract document, specification, important conditions of contract - tender and tender document, Deposits by the contractor - Arbitration, Negotiation.

UNIT - V

Text Books:

Reference Books:
GROUNDOVER IMPROVEMENT TECHNIQUES (GE 14)

UNIT I
Introduction to engineering ground modification: Need for ground improvement techniques. Traditional objectives and emerging trends. Identification of soil types. In situ and laboratory tests to characterize problematic soils. Classification of ground improvement techniques. Suitability, feasibility, and desirability.

UNIT II

UNIT III

UNIT IV

UNIT V

Text Books:

References Books:
2. Ground Reinforcement and Soil Stabilisation, Jones C. F. E. P. Butterworths, London, revised subsequent
FINITE ELEMENT METHOD (PE2)

B Tech III Year II Semester – CIVIL

Course Outcome
Upon successful completion of this course, students will be able to
CO1: Explain plane stress-plane strain equations and develop displacement functions
CO2: Analyze one-dimensional problems using stiffness matrix
CO3: Examine the different elements based on continuity and compatibility
CO4: Illustrate quadrilateral elements using nodal points and shape functions
CO5: Discuss the solution techniques for static condition

UNIT – I

UNIT – II

UNIT – III

UNIT – IV
Isoparametric formulation: Concepts of isoparametric elements for 2D analysis – 4 noded and 8 noded iso-parametric quadrilateral elements.

UNIT – V
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Text Book:

Reference Book:
Course outcomes:
After completion of this course students will be able to:

1. Understand principles and their practical application in water treatment.
2. Determine physical, chemical and biological characteristics of water and wastewater.
3. Determine the optimum dose of coagulant.
4. Estimate the chloride, nitrate and iron content in water.
5. Summarize the solutions using titration, conductivity meter, pH meter, turbidity meter and DO meter.

List of experiments:
1. Determination of pH and turbidity
2. Determination of Conductivity and total dissolved solids
3. Determination of Alkalinity and Acidity
4. Determination of Chlorides
5. Determination of Iron
6. Determination of Dissolved Oxygen
7. Determination of Nitrates
8. Determination of Optimum dose of Coagulant
9. Determination of Chlorine Demand
10. Determination of BOD
11. Determination of COD
12. Presumptive Coliform test
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Course outcomes:
After completion of this course, students will be able to:
- CO1: Classify the types of connections and specifications as per IS: 800-2007.
- CO2: Apply the provisions of IS: 800-2007 to design tension members.
- CO3: Analyze and design compression members.
- CO4: Illustrate behavior of beams and design strengths as per IS code.
- CO5: Adapt IS code procedures to design welded plate girders.

UNIT I

UNIT II

UNIT III
Design of compression members: Design of compression members - Buckling class - Slenderness ratio - Strength design - Laced - Battened columns.

UNIT IV
Design of Beams: Design of Beams - Plastic moment - Bending and shear strength - Buckling - Built-up sections - Laterally supported beams - Web buckling and web crippling strength.

UNIT V
Design of Welded Plate girders: Elements - Economical depth - Design of main section - Connections between web and flange - Design of end bearing stiffeners and intermediate stiffeners.

Text Books:

Reference Books:

IS Codes:

Note: IS: 800-2007, IS 875 are provided during the examination.
ESTIMATION & COSTING:

B.Tech IV Year | Semester - CIVIL

Course Outcome
After completion of this course students will be able to
CO1: Summarize the basic principles and standard methods for working out quantities in estimating.
CO2: Determine the earthwork estimate of buildings, roads and canals.
CO3: Estimate the rate analysis of the various items of work.
CO4: Understand the process of contracting for roads and buildings.
CO5: Evaluate the valuation of buildings and provide practical knowledge of standard specifications of items of building construction.

UNIT – I

UNIT – II

UNIT – III
Rate Analysis: Unit rate analysis for various items of building works.

UNIT – IV

UNIT – V
Valuation of Buildings: Standard specifications for different items of building construction.

Text Books:

Reference Books:
Prestressed Concrete Structures (PE3)

B. Tech IV Year I Semester : CIVIL

Credit: 3 0 0 3

Course Outcomes:
After completion of these course students will be able to:
C1: Classify the concepts, principles, types and methods of PSC structures.
C2: Evaluate the losses of PSC structures.
C3: Analyze and design of PSC slabs and beams using IS:1343 (2012).
C4: Explain transmission of prestressing force. end block analysis by different methods.
C5: Analyse the stress distribution of composite beams and assess the deflection of beams. Understand the different methods of prestressing.

UNIT - I
Introduction:
Historic development- General principles of prestressing- Pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials-high strength concrete and high tensile steel their characteristics.

Methods and Systems of Prestressing:
Pretensioning and Post tensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gulla-Edal system- Lee McCall system.

UNIT - II
Losses of Prestress:
Loss of prestress in pretensioned and posttensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT - III
Flexure:
Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections.

Shear:
General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables. Analysis of rectangular and I beams for shear- Design of shear reinforcements- IS Code provisions.

UNIT - IV
Transfer of Prestress in Pretensioned Members:

UNIT - V
Composite Beams:
Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

Deflections:
Importance of control of deflections- Factors influencing deflections- Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Text Books:

Reference Books:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

EARTHQUAKE ENGINEERING (PE3)

B.Tech IV Year I Semester - CIVIL

Course Outcomes
After completion of this course students will be able to:
1. Quantify the mechanical behaviour of earth's surface, seismic hazards and its effects.
2. Identify, formulate and solve engineering problems subjected to dynamic loading conditions.
3. Understand the internal parameters of the structures for seismic design source.
4. Assess the design component or process to meet desired needs within realistic constraints.
5. Analyze and design the members for earthquake resisting parameters.

UNIT I

UNIT II

UNIT III

UNIT IV
Introduction to earthquake resistant design: Seismic design requirements - regular and irregular configurations - basic assumptions - design earthquake loads - basic load combinations - permissible stresses - seismic methods of analysis - factors in seismic analysis - equivalent lateral force method.

UNIT V
Seismic Analysis of structures: Principles of earthquake resistant design of RC members - Structural models for frame buildings - Equivalent static analysis of any typical structure.

Text Books:

Reference Books:

IS Codes
GREEN BUILDING TECHNOLOGIES (PE3)

B Tech IV Year I Semester – CIVIL

Course Outcomes
After completion of this course students will be able to:

- CO1: Understand the Green building concept and focus on approaches that makes building sustainable.
- CO2: Illustrate Green building assessment and accreditation system.
- CO3: Able to apply low energy building strategies.
- CO4: Design green building to improve sustainability of infrastructure.
- CO5: Classify the economic benefits of green buildings.

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

Text Books:

Reference Books:
RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING (PET)  

B Tech IV Year I Semester : CIVIL  

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Course Outcomes:
After completion of this course, students will be able to:

CO1: Define and understand the various components of railways.

CO2: Understand and solve the geometric elements needed for the design of permanent way.

CO3: Define, understand and design the various components of the airport.

CO4: Define, understand the planning and requirements of a harbor.

CO5: Improve and Visualize the working of intelligent transportation system.

UNIT - I
Introduction to railway - Permanent way components - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast, Gauge. Creep of Rails - Theories related to Creep - Sleeper density

UNIT - II
Geometric design of railway track: Gradients - Grade Compensation - Cant and Negative Super elevation - Cant Deflection - Degree of Curve, Points and Crossing, Rail Joints & Welding of Joints, Railway station & Yards, Signaling & Interlocking.

UNIT - III
Airport engineering: Airport Site selection - Runway Orientation - Base, Runway Length - Corrections for Elevation - Airport Classification - Runway Geometric design concepts - Factors Controlling Runway Layout - Terminal Area - Apron, Hangar, Blast Considerations, Typical Airport Layouts - Wind Rose diagram - Runway Lightening system & Marking.

UNIT - IV
Port and harbor engineering: Requirements of Port and Harbour - Classification of Port & Harbour - Features of a Port - Planning of Harbour - Breakwaters, Dike docks, Jetties, Aprons, Transit shed and Warehouses, Navigational aids.

UNIT - V
Intelligent transport systems: ITS Definition, Benefits of ITS, user services, Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Introduction to ITS applications, ITS architecture components and standards, Overview of ITS implementations in developed countries.

Text Books:

Reference Books:
Course Outcome

After completion of this course students will be able to:

- CO1 Analyze and design of cantilever retaining wall.
- CO2 Apply the provision of IS: 3370-2009 to design water tank.
- CO3 Compute the design aspects of flat slabs.
- CO4 Adapt the provision of IRC 21-1987 to class AA loading to design T-beam girder.
- CO5 Summarize the force components and design principles of RCC chimney.

UNIT - I
Design of Retaining walls: Types of retaining walls, forces on cantilever retaining wall, stability conditions of a cantilever retaining wall, proportioning of cantilever retaining wall, introduction to counter fort retaining wall.

UNIT - II
Design of water tank: Design philosophy and requirements, IS code recommendations regarding, detailing in water tank, design of circular water tank resting on ground (approximate method), IS code method for design of circular tank, design of elevated tank with staging.

UNIT - III
Design of flat slab: Introduction terminology related with flat slab construction, IS code provision for flat slab, analysis and design of flat slab by direct design method, shear in flat slab, openings in flat slab.

UNIT - IV
Design of concrete bridges: IRC loading, design of RC slab culvert, design of T-beam Girder Bridge.

Reference Books:

Text Books:

Course outcomes
After completion of this course students will be able to
CO1: Understand different types of aquifers and their characteristics
CO2: Analyse the pumping test data for different aquifers
CO3: Distinguish the surface and subsurface investigation methods of ground water
CO4: Discuss the methods of artificial recharging of ground water
CO5: Explain the control of saline water intrusions

UNIT-I
Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties affecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention. Ground Water Movement: Permeability, Darcy’s law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system.

UNIT-II
Ground water and well hydraulics: Analysis of Pumping Test Data I: Steady flow groundwater flow towards a well in confined and unconfined aquifers Dupit’s and Theis’ equations, Assumptions, Formation constants, yield of an open well interface and well tests.

UNIT-III

UNIT-IV

UNIT-V

Text Books:

Reference Books:
CONCRETE & HIGHWAY MATERIALS LAB

B Tech IV Year I Semester – CIVIL

Course Outcomes:
After completion of this course students will be able to

CO1: Examine the experimental strength of aggregate materials as per codal provisions.
CO2: Compute the properties of bituminous materials.
CO3: Determine the properties of cement by conducting the test.
CO4: Define the workability of fresh concrete by conducting tests.
CO5: Estimate the strength of hardened concrete by conducting destructive and non-destructive testing.

List of Experiments:
1. Determine the Crushing & Impact value of given coarse aggregate sample.
2. Determine the Specific Gravity and water absorption for given sample of aggregates.
3. Determine Abrasion & Attrition value for given sample of aggregates.
4. Determine Flakiness and Elongation index for given sample of aggregates.
5. Determine the Consistency & Ductility of given Bitumen sample.
6. Determine the Softening point, Flash and Fire point of given Bitumen sample.
7. Determine the Fineness & Standard Consistency of the given cement sample.
8. Determine the Initial & Final setting time of the given cement sample.
9. Determine the Specific Gravity & Soundness of the given cement sample.
10. Determine the Young's Modulus and Compressive strength of given concrete & Cement mortar specimens.
11. Determine the Workability of given fresh concrete sample.
12. Determination of Bulking percentage of given Fine Aggregate sample & Demonstration of NDT.

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B.Tech IV Year I Semester - CIVIL

Course Outcomes
After completion of this course students will be able to:
1. CO1: Familiarise with the usage of recent software’s and its applications in the field of civil engineering.
2. CO2: Analyse the Beam and Slab using Staad Pro software.
3. CO3: Assess the frame using the Staad Pro.
4. CO4: Interpret the slope stability by using Geo5.
5. CO5: Assess the settlement of footing.

List of Experiments
1. Introduction and practice of the basic functions use in the Python computing.
2. To develop the programme for Bending moment, Shear force and Deflection at incremental segments of simply supported beam subjected to eccentric point load and UDL throughout the span.
3. Demonstration and explanation of basic commands used in Staad pro.
4. Analysis of Continuous beam using Staad pro.
5. Analysis of slab using Staad pro.
6. Analysis of 2D frame using Staad pro.
7. Analysis of space frame using Staad pro.
10. Stability of slope with retaining wall.

List of Software Required
1. Staad pro - Licensed version.
2. GeoStudio - Educational version.
3. Python - Open resource.
INDUSTRIAL ORIENTED MINI PROJECT (Summer Vacation between III- II and IV-I)

B.Tech IV Year I Semester - CIVIL

Course Outcomes
After completion of this course students will be able to:
CO1: Interpret the literature and develop solutions for framing problem statement.
CO2: Select software techniques for identifying problems.
CO3: Analysis and test the modules of planned project.
CO4: Design technical report and deliver presentations.
CO5: Apply engineering and management principles to achieve project goals.

Content
There shall be an industry-oriented Mini-Project, in collaboration with an industry of department specific specialization, to be taken up during the summer vacation after III year II Semester examination. However, the mini-project and its report shall be evaluated along with the project work in IV year I Semester. The industry oriented mini-project shall be submitted in a report form and presented before the committee. The committee consists of an external examiner, Head of the Department, the Supervisor of the Mini-project and a Senior Faculty member of the department. There shall be no internal marks for industry oriented mini-project.
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<thead>
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B. Tech. IV Year II Semester
REHABILITATION AND RETROFITTING OF STRUCTURES

B. Tech IV Year II Semester – CIVIL

Course Outcomes:
After completion of this course students will be able to:
- CO1: Illustrate the importance of inspection and maintenance.
- CO2: Summarize the impacts of corrosion and fire damage on structures.
- CO3: Identify the damage assessment and testing of structural components.
- CO4: Understand the materials and techniques needed for repairs.
- CO5: Examine the failures of the structures and health monitoring with Optimization techniques.

UNIT - I
Introduction: Rehabilitation and Retrofitting of Structures
- Types of Maintenance
- Deterioration of Structures
- Distress in Structures: Causes and Prevention
- Mechanism of Damage
- Types of Damage

UNIT - II
Corrosion of Steel Reinforcement: Causes
- Mechanism and Prevention
- Damage of Structure due to Fire
- Fire Rating of Structures
- Phenomena of Deterioration

UNIT - III
Inspection and Testing:
- Symptoms and Diagnosis of Distress
- Damage Assessment
- NDT

UNIT - IV
Repair of Structures:
- Common Types of Repairs
- Repair in Concrete Structures
- Repairs in Underwater Structures
- Coating - Shotcrete - Underpinning
- Strengthening Methods
- Retrofitting - Jacketing

UNIT - V
Health Monitoring:
- Structures and its Health
- Use of Sensors
- Building Instrumentation

Text Books:

Reference Books:
1. Repair and Rehabilitation of Concrete Structures, Monam I. Modi, Chirag N. Patel, PHI Learning Pvt. Ltd.
B Tech IV Year II Semester - CIVIL  

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

1. Understand the concepts of Photogrammetry and compute the heights of the objects using parallax.
2. Be able to comprehend the energy interactions with earth surface features, spectral properties of water bodies.
3. Understand the basic concept of GIS and its applications, know different types of data representation in GIS.
4. Be able to illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinate systems.
5. Remote sensing gives the provision of understanding about water resources management and monitoring.

**UNIT I**

**Introduction to Photogrammetry**
Principle and types of aerial photographs, stereophotography, Map Vs Mosaic, ground control, Parallax measurements for height determination.

**UNIT II**

**Remote Sensing**
- **UNIT II - I**: Basic concepts and foundation of remote sensing, elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.
- **UNIT II - II**: Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

**UNIT III**

**Geographic Information System**
- Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.
- Types of data representation: Data collection and input overview, data input and output, Keyboard entry and coordinate geometry, procedure, manual digitizing and scanning, Raster GIS, Vector GIS, File management, Spatial data, Layered GIS, Feature based GIS mapping.

**UNIT IV**

**GIS Spatial Analysis**
- Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage, vector data storage, attribute data storage, overview of data manipulation and analysis, Integrated analysis of spatial and attribute data.

**UNIT V**

**Water Resources Applications**
- **UNIT V - I**: Land use, Land cover in water resources, Surface water mapping and inventory, Rainfall, Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics.
- **UNIT V - II**: Reservoir sedimentation, Fluvial geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for artificial recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

**Text Books**

**Reference Books**
TECHNICAL SEMINAR

B.Tech IV Year II Semester - CIVIL

Course Outcomes

After completion of this course, students will be able to:

CO1: Demonstrate the skills in identifying, analyzing, and presenting a research topic.

CO2: Demonstrate the quality of knowledge gained from the literature survey on recent technologies.

CO3: Demonstrate the skills developed in communicating effectively on engineering activities with the engineering community.

CO4: Demonstrate ability to effectively manage time and presentation skills.

CO5: Design a technical report with the principles of ethics.

Content

There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of the Head of the Department, Seminar Supervisor, and a Senior Faculty member.
**COMPREHENSIVE VIVA VOCE**

B.Tech IV Year II Semester – CIVIL

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

CO1: Explain comprehensively to answer questions from all the courses.

CO2: Test Oral Presentation skills by answering questions in a precise and concise manner.

CO3: Build confidence and interpersonal skills.

CO4: Support the students to face interview both in the academic and industrial sectors.

CO5: Improve placements and better performers in their future.

**Content**
The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students understanding of the courses he studied during the B.Tech course of study. There are no internal marks for the Comprehensive Viva-Voce.
MAJOR PROJECT

B Tech IV Year II Semester - CIVIL

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Course Outcomes
After completion of this course students will be able to
CO1 Identify, Analyse and apply suitable current techniques and tools to solve a problem in the civil engineering domain and societal issues.
CO2 Function effectively in teams to accomplish a common goal.
CO3 Organise the technical report writing and communication effectively.
CO4 Extend in lifelong activity.
CO5 Define and analyse a problem to assess health, safety and legal issues.

Content
The End Semester Examination of the project work shall commence from IV-IV and internal evaluation shall be conducted by the committee as appointed for the major project. In addition, the Project Supervisor shall also be included in the committee. The Internal Evaluation shall be on the basis of two reviews given by each student on the topic of the project. The major project topics shall be different from industry oriented mini project, seminar and mini project work. The external evaluation of major project work shall be made at the end of the IV-IV by the external examiner along with the Head of the Department, the Supervisor of the project and a Senior Faculty member of the department.

Signature 1
Signature 2
### OPEN ELECTIVES OFFERED BY CIVIL ENGINEERING DEPARTMENT

<table>
<thead>
<tr>
<th>Category</th>
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| OE-1     | 1. Elements of civil Engineering  
|          | 2. Smart cities  
|          | 3. Disaster Management  |
| OE-2     | 1. Green building Technologies  
|          | 2. Environmental Pollution & control methods  
|          | 3. Construction Management  |
| OE-3     | 1. Remote Sensing & GIS  
|          | 2. Introduction to earthquake Engineering  
|          | 3. Solid Waste Management  |
Course Outcome
After completion of this course students will be able to:
- CO1: Understand Geological properties and of civil engineering.
- CO2: Plan the concept of different building byelaws and planning principles.
- CO3: Analyse the properties of the fluid changes treatment process.
- CO4: Apply modern tools of surveying.
- CO5: Evaluate the principles of highway geometric designs and types of pavements as per IRC standards.

UNIT - I
Basics of Engineering Geology: Geology - branches of geology, weathering of rocks, mineralogy, definition, importance of study of minerals, classification of minerals, petrology, geological classification of rocks. Soil formation, types of soils.

UNIT - II

UNIT - III
Fluid mechanics: Dimensions and units - physical properties of fluids, specific gravity, surface tension, problems of viscosity, vapor pressure and their influences on fluid motion, Cavitation, Atmospheric, Gauge and Vacuum Pressure.

UNIT - IV
Surveying: Definition of surveying, principle, types of surveying, objectives and classification. Total Station: Limitation, Advantages GIS: Applications GPS.

UNIT - V

Text Books:

Reference Books:
SMART CITIES (OF I)

B Tech III Year I Semester – CIVIL

Course Outcome
After completion of this course students will be able to
CO1 Understand the necessity of smart infrastructure and to promote cities that provide quality of life to citizens.
CO2 Explain technology-based solutions for smart mobility.
CO3 Illustrate & introduce the smart and sustainable waste and water management for smart cities.
CO4 Apply Energy-Efficient strategies in city.
CO5 Evaluate economical models for smart infrastructure solution.

UNIT - I
Introduction: Defining Smart cities & Types, Sustainable Development & Cities, Need for smart cities, Concept of smart cities, Smart city components and categories, Potential locations, Physical infrastructure, social infrastructure, Smart City Mission.

UNIT - II
Smart Mobility: Objectives & Components of smart mobility, Emerging concepts & strategies, Real-time supported mobility systems in cities, Real-time traffic information system, Parking information system, car bike sharing system, Modal split, Public Mobility- Vehicle & Transport solutions.

UNIT - III
Smart Water & Waste Management: Functions & Objectives of smart water management, Smart water management solutions, benefits, Smart waste management objectives & scope, Waste management Approaches, Smart waste management strategies, Smart Bins, Automated waste Collection system (AWCS), Swachh Bharat Mission.

UNIT - IV
Smart Energy: Smart Energy Concept, Objectives & Elements, Strategies for smart Energy-Efficient buildings & use of Renewable energy, smart Grid.

UNIT - V
Towards Smart Cities: Investment for Land, Power, Water, and Highway and Road Rail Connectivity, Fuel Pipe lines, Smart Economies concept & benefits, Smart Governance Functions & Objectives, Smart Cities- Indian case studies.

Text Books:
1. Introduction to Smart Cities, P P Anil kumar, First Edition, 2019
DISASTER MANAGEMENT (OF 1)

B Tech III Year I Semester - CIVIL

Course Outcomes:
After completion of this course students will be able to

CO1 Understanding the various types of disaster and its effect.
CO2 Illustrate the aspects of Environmental impacts assessment (EIA).
CO3 Demonstrate assessment of risk mitigation.
CO4 Assess the functional impacts of disaster management.
CO5 Integrate the management cycle and risk reduction.

UNIT-I
Introduction To The Different Types Of Disasters:
Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, tsunamis, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climate change, global warming, Sea level rise, ozone depletion.
Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil well, air pollution, water pollution, deforestation, industrial waste, water pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT-II
Environment And Disasters:
Environment, ecosystem and disasters. Climate change - issues and concerns. Industrial hazards and safety measures.

UNIT-III
Disaster Risk Mitigation:

UNIT-IV
Disaster Management:
Effect to mitigate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management: national disaster management framework; financial arrangements; role of NGOs, community based organizations and media; Central, state, district and local administration; Armed forces in disaster response; Disaster responses; Police and other organizations.

UNIT-V
Planning For Disaster Rescue AndRisk Reduction:
Community-hazard profile of the disaster site. DM cycle. Different phases of Disaster Management: Predisaster stage, Emergency stage. Post disaster stage: Implementation of different disaster management phase and Relief mechanism during different disaster stages including cyclones, earthquakes, fire accidents, Tsunami, landslides etc. Disaster Management Act (2005); Disaster Management Policy (2009).

Text Books:
Introduction To The Different Types Of Disasters:
Natural Disasters: Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, tsunamis, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climate change, global warming, Sea level rise, ozone depletion.
Man-Made Disasters: Nuclear disasters, chemical disasters, biological disasters, building fire, coal mine, forest fire, oil spill, air pollution, water pollution, deforestation, industrial waste, water pollution, road accidents, rail accidents, air accidents, sea accidents.
UNIT II
Environment And Disasters:

UNIT III
Disaster Risk Mitigation:

UNIT IV
Disaster Management:

UNIT V
Planning For Disaster Rescue And Risk Reduction:

Text Books:
GREEN BUILDING TECHNOLOGIES (OF 2)

E-Tech III Year II Semester — CIVIL

Course Outcomes:
After completion of this course, students will be able to:

C.01 Understand the Green building concept and focus on approaches that make buildings sustainable.
C.02 Illustrate Green building assessment and accreditation systems.
C.03 Able to apply low energy building strategies.
C.04 Design green buildings to improve sustainability of infrastructure.
C.05 Classify the economic benefits of green buildings.

UNIT – I

UNIT – II

UNIT – III
Green building design: Conventional versus Green Building Systems, green materials, material selection criteria, Exceeding the Green Building Project, Integrated Design Process, Role of the charrette in the design process.

UNIT – IV

UNIT – V

Text Books:

Reference Books:
1. IGBC Reference manual (2016)
ENVIRONMENTAL POLLUTION & CONTROL METHODS (OE2)

B Tech III Year II Semester - CIVIL

Course Outcomes
After completion of this course, students will be able to:
(CO1) Understand the various air pollutants and their effect on the environment.
(CO2) Analyze quality of air in the form of air quality index and dispersion modeling.
(CO3) Illustrate about water pollution and solid waste management.
(CO4) Analyze and measure the load of waste contamination.
(CO5) Predict types of noise and problems arise due to noise pollution.

UNIT I
Introduction to air pollution: Air and its composition, Air Pollution, Sources of air pollution and its classification.
Major air Pollutants and their characteristics, Specific group pollutants such as CFC, GHG etc.
Air Pollutants from various industrial sectors, Impact of air pollution on human health and vegetation.

UNIT II
Air quality: Introduction to Air quality index and Comprehensive Environmental Pollution Index etc. and its application.
Sampling and measurement of air pollutants, Introduction to National Ambient Air Quality Standards.
Impacts of Air pollution: Extreme air Pollution scenarios, Acid Rain, Global Warming, Smog, Ozone layer depletion.

UNIT III
Water Pollution: Introduction to water pollution, sources of water pollution—Industrial, Agricultural, and Biomedical.
Solid waste Management: Introduction, Definition, Types of solid waste, Municipal Solid Waste management, and Industrial Waste Management.

UNIT IV
Soil pollution: Soil contamination by chemical pollutants, sources, Remediation by plants, bioremediation by macroorganisms, contamination by inorganic (including heavy metals) and organic pollutants, factors affecting uptake of contaminants, prevention and elimination of contamination, landfills. Effects of atmospheric deposition on various types of soils, Cation exchange capacity (CEC) of soils.

UNIT V
Introduction to noise: Difference between sound and noise, Pitch and Frequency, Sound Pressure, Sound Pressure level (Decibel), and sources of noise and harmful effects of noise, noise measurement and noise control measures.

Text Books:
CONSTRUCTION MANAGEMENT

UNIT-I

UNIT-II
PERT & CPM: Significance of PERT & CPM Techniques in Construction Management, Project Scheduling, Network Analysis, Cost-Time Analysis in Network Planning, Float, Total Float & Free Float.

UNIT-III
BIDDING: Definition and Process, Various steps in Bidding, M Book- Master Roll

UNIT-IV

UNIT-V

Text Books:

Reference Books:
Course Outcomes:
After completion of this course students will be able to:

CO1: Select the type of remote sensing technique/data for required purpose.

CO2: Identify the earth surface features from satellite images.

CO3: Analyze the energy interactions in the atmosphere and earth surface features.

CO4: Prepare thematic maps.

CO5: Interpretations of satellite data for various applications.

UNIT I
EMR and its interaction with atmosphere & Earth:
Definition of remote sensing and its components - Electromagnetic spectrum, wavelength regions important to remote sensing. Wave theory, Particle theory, Stefan Boltzmann and Wien's Displacement Law. Atmospheric scattering, absorption. Atmospheric windows and spectral signature concepts - typical spectral reflective characteristics of water, vegetation and soil.

UNIT II
Platforms and sensors:

UNIT III
Image interpretation and analysis:

UNIT IV
Geographic information system:

UNIT V
Data entry, storage and analysis:

Text Books:

References Books:
INTRODUCTION TO EARTHQUAKE ENGINEERING

UNIT I

UNIT II

UNIT III
Measurements of Earthquakes: Magnitude, intensity, energy released, earthquake measuring instruments, seismoscope, seismograph, accelerometer. Interpretation of seismic records, seismic zones of India, concept of seismic microzonation.

UNIT IV
Strong Ground Motion: Response of Structures to Earthquake Motion, Fundamentals of wave motion, seismic wave types, reflection and refraction of plane waves at a plate boundary, boundary conditions, energy conversions, focus on Indian earthquakes.

UNIT V
Seismic Hazard: Introduction to Seismic Hazard, types of hazard, time parameters of hazards, local site effects and evaluation methods. Concepts of earthquake resistant building: Building configurations - introduction, functional planning, continuous load path, characteristics of buildings.

Text Books:

Reference Books:
SOLID WASTE MANAGEMENT (OE3)

B.Tech IV Year I Semester - CIVIL

Course Outcomes
After completion of this course students will be able to:

CO1: Illustrate the hierarchical structure in solid waste management and an integrated solution.
CO2: Apply the legal legislation, economic analysis of the solid waste management system.
CO3: Identify route optimization for a solid waste collection and transport system.
CO4: Understand legal and economical points related to general solid waste management.
CO5: Plan site selection for a landfill.

UNIT I
Waste Management: Solid waste problem, meaning and definition of solid waste, concept and classification of municipal solid waste, Impacts of solid waste on environment.

UNIT II
Solid waste management rules and Regulations: Developing a solid waste collection and transfer system, characterizing waste generation, Determining public and private collection or transfer options.

UNIT III
Waste management techniques: Solid waste management Hierarchy, waste prevention, definition of source reduction, waste reduction at source using 5R’s Technique.

UNIT IV
Waste disposal Techniques: Waste disposal, composting, principles of composting, factors affecting composting, vermi composting, waste to energy techniques, Landfill technique and design and operating procedure of landfill

UNIT V
Solid waste management of Biomedical waste, plastic and E-waste: Biomedical waste – sources and generation, biomedical waste management, plastic – Dangers of plastic wastes, Recycling and disposal of plastic wastes, E – wastes Definition, Health hazards, Economic waste management and conclusion

Text Books:

Reference Books:
## Minor in

### Construction Engineering and Management

**COURSE STRUCTURE**

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<th>S. No</th>
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<td>Conventional/MOOCS</td>
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**Total Credits**: 18
Course Outcomes
Students who successfully complete this course will have demonstrated ability to:

- CO1: Students will be able to perform a detailed surveying at any site by any method.
- CO2: Ability to use modern survey equipment to measure angles and distances.
- CO3: Ability to measure differences in elevation, draw and utilize contour plots, and calculate volumes for earthwork.
- CO4: Understand the working principles of modern equipment and its methodologies.
- CO5: Analyze the basic concept of GPS and its applications.

UNIT-I
Introduction to surveying: Definition of surveying, objectives of surveying, principles and types (plane surveying and geodetic surveying), Scales (Plane, diagonal, chord, vernier, micro).
Conventional Symbols and Signals.

UNIT- II
Distances and direction:
Distance measurement methods, electronic distance measurements, meridians, azimuths and bearings, declination, computation of angle.

UNIT- III
Leveling and contouring: Level, types of levels (Dumpy, reversible, tilting, digital) and their parts, Temporary adjustments – method of leveling (Simple, differential, fly, profile, precise, reciprocal). Contours, Characteristics and Uses of contours.

UNIT- IV
Modern field surveying systems: Electronic distance measurements, types of EDM instruments (Microwave instruments, Infrared wave instruments, Light wave instruments), total station – parts of a total station, accessories advantages and applications, errors in total station survey.

UNIT- V
Introduction to Remote Sensing: Global positioning systems – segments, GPS measurements, errors in biases, surveying with GPS, Coordinate transformation, accuracy considerations, electromagnetic spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, Remote sensing data acquisition, platforms and sensors, visual image interpretation, digital image processing.

Text Books

References
Course Outcomes:
In the end of this course, the student will be able to:
- CO1: Apply the principles of surveying for civil engineering applications
- CO2: Apply the knowledge to calculate the areas, drawing plans, and contour maps using different measuring equipment at field level
- CO3: Identify data collection methods and prepare field notes
- CO4: Understand the working principles of survey instruments: measurement, errors, and corrections
- CO5: Interpret survey data and compute areas and volumes, levels by different types of equipment and utilize the knowledge in the modern equipment and its methodologies

List of experiments:
1. Survey of an area by chain surveying
2. Determination of two inaccessible points by using prismatic compass
3. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment
4. An exercise on T.S.S. and Plotting
5. Trigonometric levelling: Heights and distance problem
6. Determination of Area & Remote height using total station
7. Topography & Contouring using total station
8. Distance, gradient, DHR: Height between two inaccessible points using total station
9. Study on use of GPS for data collection
10. Collection of Point Data, Line Data, and Polygon Data using GPS
Course outcomes

On successful completion of this course, it is expected that the students will be able to:

- CO1: Identify various building components, conventional signs and symbols.
- CO2: Illustrate the building bye-laws and the principles of planning.
- CO3: Understand about the building services and safety.
- CO4: Design and Sketch the plans of various types of buildings and detailing of doors, windows, etc.
- CO5: Understand the elements of perspective drawing involving simple problems.

UNIT - I

Basic components of buildings: Various components of building like various types of footing (isolated & pile), various types of door, window, and ventilators, lintels and arches, stairs and staircase, trusses, flooring, roofs etc and its applications in building planning.

UNIT - II

Building planning: provision on national building code, building bye-laws, open area, setbacks, FAR terminology, principles of architectural composition (ie. Unity, contrast etc), principles of planning.

UNIT - III

Building Services - Introduction of building services like water supply and drainage, electrification, ventilation and lighting and staircases, fire safety, thermal insulation, acoustics of buildings.

UNIT - IV

Design and Drawing of Building: Design and preparation of detailed drawings of various types of buildings like residential building, institutional buildings and commercial buildings, detailing of doors, windows, ventilators and staircases etc.

UNIT - V

Perspective Drawing: Elements of Perspective Drawing involving simple problems, one point and two point Perspectives, principles of energy efficient buildings.

Textbooks


References

COMPUTER AIDED BUILDING PLANNING IAR

Course Outcomes:
At the end of the course, the student will be able to:
1. Draft the Front Elevation and Section of the buildings
2. Develop the components of the building
3. Research the development of working and industrial structures
4. Detail development of planning principles

List of Experiments:
1. Introduction to the Basic commands of CAD software
2. Practice using the Basic commands of CAD software
3. Detailing of different types of walls, doors, and windows by using CAD
4. Detailing of different types of doors, windows, and walls by using CAD
5. Drawing of a single story building with brick thickness
6. Drawing of plans of multi-stored buildings with brick thickness (Max 5 stories)
7. Designing beams and columns of single story buildings
8. Detailed drawing of Roofs by using CAD
9. Exercises on the development of working of building by using CAD (Layout development)
AI APPLICATIONS IN CONSTRUCTION PRACTICES

Unit I:

Unit II:

Unit III:

Unit IV:
AI applications in construction: contour crafting, advantages & applications, prototyping, planning of buildings, plumbing and electrical works, roller painting, digital control concept, robotics in earth works, inspection of infrastructures.

Unit V:
Challenges in AI: Different challenging construction problems, knowledge discovery, risk estimates, fault analysis, damage assessment, and prediction, and defect detection. Tremendous transformation has taken place in the past years with the emerging applications of AI.

Textbook:
CONSTRUCTION MANAGEMENT

Course Outcomes

Upon successful completion of this course, students will be able to:

- CO1: Understand the behavioral aspect of entrepreneurs, various approaches of time management, their strength and weakness.
- CO2: Apply the concepts of project management during the construction phase, project organization, project planning and control using CPM, PERT techniques.
- CO3: Analyze various materials and equipment's for construction work.
- CO4: Examine the on different types of contracts and specifications.
- CO5: Outline the labour regulations and safety in construction.

UNIT - I
Management Techniques: Roles, Management theories, Social responsibilities, Planning and strategic management, Strategy implementation, Decision making tools and techniques, Organizational structure, Human resource management, motivation, performance, leadership.

UNIT - II

UNIT - III
Resource Management: Resource planning, planning for manpower, materials, costs, equipment, Labour, Scheduling, Forms of scheduling, Resource allocation, Budget and budgetary control methods.

UNIT - IV

UNIT - V

Textbooks

References
MINI PROJECT

Course Outcomes

After completion of this course students will be able to:

C01: Interpret the literature and develop solutions for framing problem statement.
C02: Select software techniques for identifying problems.
C03: Analyze and test the modules of planned project.
C04: Design technical report and deliver presentations.
C05: Apply engineering and management principles to achieve project goals.

Content

There shall be department specific or multidisciplinary Mini-Project with industry applications to be taken up IV-II semester. However, the mini-project and its report shall be evaluated by a committee consisting of an external examiner, Head of the Department, the Supervisor of the Mini-project, and a Senior Faculty member of the department.

List of MOOCs courses on Swayam (NPTEL)

It is instructed that a student has to opt minimum 12 week online courses to earn the required credit.

1. Remote Sensing Essentials
2. Digital Land Surveying And Mapping (DLS&M)
3. Geographic Information Systems
4. Safety in Construction
5. Natural Hazards
6. Probability Methods in Civil Engineering
7. Urban Transportation Systems Planning
8. Introduction to Civil Engineering Profession
9. Urban Transportation Systems Planning
10. Architectural conservation and Historic preservation

Signatures
## Honors in Structural Engineering

<table>
<thead>
<tr>
<th>S. No</th>
<th>Year Semester</th>
<th>Course</th>
<th>Mode of Learning</th>
<th>No. of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC 1</td>
<td>III-I</td>
<td>Advanced R.C. Design</td>
<td>Conventional</td>
<td>3</td>
</tr>
<tr>
<td>HC 2</td>
<td>III-I</td>
<td>Advanced Concrete Lab</td>
<td>Conventional</td>
<td>1.5</td>
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<tr>
<td>HC 3</td>
<td>III-II</td>
<td>Structural Dynamics</td>
<td>Conventional</td>
<td>3</td>
</tr>
<tr>
<td>HC 4</td>
<td>III-II</td>
<td>Computer-aided structural design Lab</td>
<td>Conventional</td>
<td>1.5</td>
</tr>
<tr>
<td>HC 5</td>
<td>IV-I</td>
<td>Research Methodology</td>
<td>Conventional</td>
<td>3</td>
</tr>
<tr>
<td>HC 6</td>
<td>IV-I</td>
<td>Technical Paper Writing</td>
<td>Under the mentorship of a supervisor</td>
<td>2</td>
</tr>
<tr>
<td>HC 7</td>
<td>IV-II</td>
<td>Cost management of Engineering projects: one course from MOOCS</td>
<td>Conventional MOOCS</td>
<td>3</td>
</tr>
<tr>
<td>HC 8</td>
<td>IV-II</td>
<td>Earthquake Resistant Design Of Buildings: one course from MOOCS</td>
<td>Conventional MOOCS</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 20
Course Outcomes

After completion of this course students will be able to

CO1: Understand the various design concepts of simply and doubly reinforced beam and draw the reinforcement details.

CO2: Design the beam under deflection and check the serviceability requirements for RC structural elements.

CO3: Analyze the rotation of RC members.

CO4: Design of different slabs with the reinforcement details.

CO5: Explore the design concept of Corbels.

UNIT I


UNIT II

Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs, short term deflection and long term deflection, estimate on of crack width in RCC members, calculation of crack widths.

UNIT III

Limit Analysis of R.C. Structures: Rotation at a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, and applications for fixed and continuous beam.

UNIT IV

Flat slabs: Direct design method. Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns - Shear in Flat slabs - Check for one way and two way shears - Introduction to Equivalent frame method.

UNIT V


Textbooks


References

4. IS : 456 : 2000, Code of Practice for Plain and Reinforced Cement Concrete
5. SP 16, SP 34
6. [Signature]
7. [Signature]
8. [Signature]
9. K. Deo
Course Outcome

After completion of this course students will be able to

CO1: understand the properties of the materials and the behavior of the concrete
CO2: Draw the Gradation Charts of Aggregates
CO3: apply the knowledge to calculate workability and permeability of concrete
CO4: identify the air entrainment and curing of concrete
CO5: Explore different Chemical Admixtures on concrete.

EXPERIMENTS

1. Tests on cement – Consistency, Setting time, Soundness, Compressive Strength.
2. Gradation Charts of Aggregates.
4. Aggregate Crushing and Impact value
5. Workability Tests on self compacting concrete
6. Air Entrainment Test on fresh concrete.
7. Marsh cone test.
8. Permeability of Concrete.
9. Non Destructive Testing of Concrete.
10. Accelerated Curing of Concrete.
11. Influence of W/C ratio on strength and Aggregate : Cement ratio on workability and Strength
Course Outcomes

- After completion of these course students will be able to:
  - CO1: Classify the concepts and principles of vibratory system
  - CO2: Evaluate the methods of discretization technique
  - CO3: Analyze the harmonic, periodic, impulsive and general dynamic loadings
  - CO4: Explain the solutions of eigen value problem
  - CO5: Explore various types of Earthquake Response Systems

UNIT – I

UNIT – II
Introduction to Structural Dynamics: Fundamental objectives of dynamic analysis Types of prescribed loading - Methods of discretization Formulation of equations of motion by different methods - Direct equilibrium using Newton’s law of motion - D'Alembert’s principle - Principle of virtual work and Hamilton principle

UNIT – III

UNIT – IV

UNIT – V
Deterministic Earthquake Response of Systems - Rigid Foundation, Types of Earthquake Excitation Response to Rigid - Soil Excitation, Lumped SDOF elastic systems Lumped SDOF elastic system - Distributed Parameter Elastic systems - SIRD, UQ combination of modal responses
Text books

1. Structural Dynamics by Mario Par, C R S Publishers, New Delhi

References

1. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi
2. Vibrations, Dynamics and Structural systems by Madhuri Mukhopadhyay, CRC press
COMPUTER AIDED STRUCTURAL DESIGN LAB

Course Outcomes

After completion of these course students will be able to
1. O1: Analyze and design of structural elements using computer aided tools.
2. O2: Understand the design concept using different software packages.
3. O3: Analyze the 2D building frame using STAAD Pro.
4. O4: Explain the design principle of circular water tank.
5. O5: Design the bridge deck slab using STAAD Pro.

EXPERIMENTS

1. Program for design of slabs using Excel.
2. Program for design of beams using Excel.
3. Program for design of columns using Excel.
4. Program for design of footing using Excel.
5. Program for design of staircase using Excel.
6. Program for design of cantilever retaining wall using Excel.
7. Analysis of 2D building frame using STAAD Pro.
8. Analysis of truss using STAAD Pro.
10. Analysis of multistoreyed space frame using STAAD Pro.
11. Analysis of circular water tank using STAAD Pro.
12. Analysis of bridge deck slab using STAAD Pro.
Course Outcome:
After completion of this course students will be able to:

CO1: Summarize the basic principles of Research and various methodologies.
CO2: Understand characteristics of good Hypothesis.
CO3: Explore importance of Philosophical, Historical and Experimental aspects of research.
CO4: Identify Research Problem by rigorous literature review.
CO5: Find the techniques to collect Primary and secondary data.

UNIT-I
Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, types of Research, Research Approaches, Significance of Research, Research Methods vs Methodology, Research and Scientific Methods, Research Process, Criteria of Good Research.

UNIT-II
Research Questions and Hypothesis: Variables and their linkages, characteristics of good Hypothesis, Research question and formulation of hypotheses—directional and non-directional hypotheses, Basis for hypotheses.

UNIT-III

UNIT-IV
Defining the Research Problem: Concept and need, Identification of Research problem, defining and delimiting Research problem, Exercise on research problem definition.

UNIT-V
Tools for Data Collection: Collection of Primary Data, Collection of Data through questionnaire and Schedules, other Observation Methods, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study, Focus Group Discussion, Techniques of developing research tools, viz. Questionnaire and rating scales etc, Reliability and validity of Research tools.

Textbooks

Reference Books
Course Outcomes
After completion of this course students will be able to
CO1: Understand that how to improve your writing skills and level of readability
CO2: Learn about what to write in each section
CO3: Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission
CO4: Analyze the results and explain in detail.
CO5: understand the importance of Conclusion and future scope.

UNIT - I
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy. Avoiding Ambiguity and Vagueness.

UNIT - II

UNIT - III
Requirements for writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

UNIT - IV
Requirements for writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion.

UNIT - V
Skills required for writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

Textbooks:
COST MANAGEMENT OF ENGINEERING PROJECTS

Course Outcomes
After completion of this course students will be able to
CO1: understand various Strategic Cost Management Process
CO2: Determine various stages of project execution.
CO3: Estimate the rate analysis and project cost control of the various items.
CO4: Understand the process of Break-even and profit analysis.
CO5: Evaluate the Quantitative techniques for cost management.

UNIT-I

UNIT-II
Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning; Project execution as conglomerate of technical and non-technical activities.

UNIT-III
Detailed Engineering activities: Pre-project execution main clearances and documents Project team: Role of each member; Importance Project site: Data required with significance; Project contracts; Types and contents; Project execution Project cost control. Bar charts and Network diagram; Project commissioning: mechanical and process.

UNIT-IV

UNIT-V

Textbooks:
1. Chartered Accountancy A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster. Advanced Management Accounting
EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

Course Outcomes
After completion of this course students will be able to
CO1: Quantify mechanical behaviour of earth's surface, seismic hazards and its effects.
CO2: Identify the Conceptual design methods for solving engineering problems.
CO3: Understand the internal parameters of the structures for seismic design source.
CO4: Assess the design component or process to meet desired needs within realistic constraints.
CO5: Analyse and design buildings to resist seismic forces.

UNIT - I

UNIT - II

UNIT - III
Introduction to earthquake resistant design: Seismic design requirements - regular and irregular configurations - basic assumptions - design earthquake loads - basic load combinations - permissible stresses - seismic methods of analysis - factors in seismic analysis - equivalent lateral force method - dynamic analysis - response spectrum method - Time history method.

UNIT - IV

UNIT - V

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Text books

References

Reference codes
MOOCs Courses

It is instructed that a student has to opt minimum 12 week online courses to meet the required credit.

1. Introduction to Accounting and Finance for Civil Engineers
2. Development and Applications of Special Concretes
3. Geosynthetics And Reinforced Soil Structures
4. Maintenance and Repair of Concrete Structures
5. Advanced Topics in the Science and Technology of Concrete
6. Advanced Soil Mechanics
7. Soil Structure Interaction
8. Modern Construction Materials
9. Expansive Soil
10. Scheduling Techniques in Projects
11. Introduction to Lean Construction (Module 1 - Lean Basics)
12. Construction Methods and Equipment Management
13. Safety in construction
14. Plastic Analysis
15. Sub Structure Design