SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B. Tech.   Branch: Civil Engineering   Semester: VIth

Academic Session: 2024-25   w.e.f - Date-02-09-2024

BCE061 Design of Hydraulic Structures

Course Contents

Course Objectives:
1. Develop a comprehensive understanding of the principles of fluid mechanics and hydraulic engineering relevant to the design of hydraulic structures.
2. Apply design principles for various hydraulic structures, including dams, spillways, levees, and flood control systems, ensuring structural integrity and safety.
3. Conduct hydraulic analyses to determine flow conditions, pressure distributions, and potential hydraulic issues in designed structures.

Unit-I
Gravity dams: Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

Unit-II
Earth and Rock fill dams : Earth Dams: Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.
Rock fill dams: Types, merits and demerits, conditions favourable for their adoption.

Unit-III
Spillways : Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.

Unit-IV
Energy Dissipations And Gates : Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles and details. Design of canal regulating structures, detaild design of Sarda Falls, design of cross drainage works, sphypon aqueduct.

Unit-V
Hydropower Plants: Introduction of Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

Course Outcome

CO1 To understand gravity dam, stability analysis, galleries in dam

CO2 To understand earthen dam, seepage study, pore pressures.

CO3 Analysis of spillway, emergency spillway.

CO4 Illustrate energy dissipations, gates, canal regulating structures.

CO5 To understand hydropower plants, turbines, surge tank and tidal plants.

Reference Books: -

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. by Punmia & Pandey
5. Water Power Engineering by Dandekar

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BCE062 Structural Design I (RCC)

Course Contents

Course Objectives:
1. To educate the student about the concept of reinforced cement concrete and different method of design of reinforced concrete.
2. To educate the student about concept of working stress method to analysis and design of beams.
3. To educate the student about concept of limit state method to analysis and design of beams, slabs and columns.
4. To educate the student about analysis and design of footings and staircases by limit state method.

Unit-I

Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

Unit-II

Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

Unit-III

Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

Unit-IV

Columns & Footings: Effective length of columns, Short and long columns - Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

Unit-V

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slab less tread-riser staircase.

Course Outcome

CO1 To understand various properties of concrete and reinforcement steel, WSM & LSM.
CO2 Analysis of design of beam, lintel, continuous beam, girders.
CO3 Analysis of design of various types slabs.
CO4 Analysis of design of columns and various type of footing, raft foundation.
CO5 Analysis of design of staircase with different supports conditions, slab less tread-riser staircase.

NOTE :- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)

Reference Books: -
1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.
9. Design of Concrete Structure, Ramchandra & V.Gehlot, Scientific Publisher, Jodhpur

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BCE063 Geotechnical Engineering – I

Course Contents

Course Objectives:
1. To provide basic knowledge about Geotechnical Engineering, soil formation, index properties of soil, physical and engineering properties of soil.
2. To know about the types of soil according their classification, classification system, field identification, study of effective stress, capillary seepage force, etc.
3. How to measure the compaction and permeability of soil by lab experiments theoretically uses of Darcy law. Two dimensions flow and develop flow net and characteristics.
4. To know about stresses due to applied load a soil mass, consolidation and their factor one dimensional consolidation as per Terzaghi theory
5. To find shear strength in soil with the help of Mohr circle. How shear strength can be determine in laboratory, soil exploration

Unit-I
Basic Definitions & Index Properties: Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behavior. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

Unit-II
Soil Water and Consolidation: Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flow nets, uses of a flow net, Effective, neutral and total stresses. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of reconsolidation pressure, settlement analysis. Calculation of total settlement.

Unit-III
Stress Distribution in Soils and Shear Strength of Soils: Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. Newmark's influence chart. Contact pressure distribution. Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore

pressure parameters, critical void ratio, Liquefaction.

Unit-IV
Stability of Slopes: Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

Unit-V
Lateral Earth Pressure: Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wallfriction. Arching in soils. Reinforced earth retaining walls.

Course Outcome

CO1 To understand of basic definition and index properties of soil, minerals, soil structures.
CO2 To understand of soil-water relationship, seepage, flow nets.
CO3 To understand stress distribution in soils and shear strength of soil.
CO4 To understand the stability of slopes.
CO5 To understand lateral earth pressures, active & passive.

Reference Books: -

1. Soil Mech. & Found. Engg. by Dr. K.R. Arora - Std. Publishers Delhi.
2. Soil Mech. & Found. by Dr. B.C.Punmia- Laxmi Publications, Delhi.
3. Modern Geotech Engg. by Dr.l Aram Singh - IBT Publishers, Delhi.
4. Geotech Engg. by C. Venkatramaiah - New Age International Publishers, Delhi
5. Soil Mech. & Found. Engg. by S.K. Garg- Khanna Publishers, Delhi.
6. Soil Testing for Engg. by T.W. Lambe - John Wiley & Soms. Inc.
7. Relevant I.S. Codes.

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BCE064 Transportation Engg-II

Course Contents

Course Objectives:
1. Students will learn the fundamental principles of structural engineering as they apply to rail bridge and tunnel design.
2. The course will cover relevant design codes, safety standards, and regulations specific to rail infrastructure.
3. How to measure the compaction and permeability of soil by lab experiments theoretically uses of Darcy law. Two dimensions flow and develop flow net and characteristics.
4. The course will explore various construction methods used in building rail bridges and tunnels, including traditional and innovative techniques.

Unit-I

Introduction, Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations. Route Surveys and alignment, railway track, development and gauges. Hauling capacity and tractive effort.

1. Rails: types, welding of rails, wear and tear of rails, rail creep.

2. Sleepers: types and comparison, requirement of a good sleeper, sleeper density.

3. Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails.

4. Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast. Different methods of plate laying, material trains, and calculation of materials required, relaying of track.

Unit-II

Geometric Design; Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and cant deficiency, various curves, speed on curves. Types locations, general equipments, layouts, marshalling yards. Definition, layout details, design of simple turnouts. Types of signals in stations and yards, principles of signaling and inter-locking.

Unit-III

Bridge Site Investigation and Planning ; Loading Standards & Component parts: Selection of site, alignment, collection of bridge design data : essential surveys, hydraulic design, scour depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges : Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges. Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

Unit-IV

Bridge Foundations, Construction, Testing and Strengthening of Bridges: Different types of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants, inspection and data collection, strengthening of bridges, Bridge failure.

Unit-V
Tunnels:

Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts. Construction of tunnels in soft soil, hard soil and rock. Different types of lining, methods of lining. Mucking operation, Drainage and ventilation. Examples of existing important tunnels in India and abroad.

Course Outcome

CO1 Identify gauges and component parts of railways,
CO2 Study of geometric design, station and yards cant and cant deficiency, turnouts, signals and inter-locking.
CO3 Understand Bridge types, Components of Bridge, bridge failure.
CO4 Identify types of tunnel, methods of Tunneling, drainage and ventilation.
CO5 Identify types of harbors, sounding methods, docks, inland water operation.

References Books:-
 1.Chakraborty and Das; Principles of transportation engineering; PHI
 2.Rangwala SC; Railway Engineering; Charotar Publication House, Anand
 3.Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
 4.Ponnuswamy; Bridge Engineering; TMH
 5.Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons.
 6.Railway Track by K.F. Antia
7.Principles and Practice of Bridge Engineering S.P. Bindra - Dhanpat Rai & Sons.
8.Bridge Engineering - J.S. Alagia - Charotar Publication House, Anand
9.Railway, Bridges & Tunnels by Dr. S.C. Saxena
10.Harbour, Docks & Tunnel Engineering - R. Srinivasan
11.Essentials of Bridge Engg. By I.J. Victor; Relevant IS & IRS codes

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Elective – II BCE0651 Advanced Water Resources Engineering

Course Contents

Course Objectives:
1. Develop a deep understanding of hydrological cycles, water quality, and the dynamics of surface and groundwater systems.
2. Learn advanced techniques for modeling and simulating water resources systems, including hydraulic modeling, hydrologic modeling, and water quality modeling..
3. Understand the legal and regulatory frameworks governing water resources, including water rights, environmental regulations, and international agreements.

Unit-I

Optimal Rain gauge Network Design, Adjustment of Precipitation Data, Depth Area-Duration Analysis, Design Storm, Probable Maximum Precipitation, Probable Maximum Flood, Flood Frequency Analysis, Risk Analysis,

Unit-II

Flood Management, Flood Routing through Reservoirs, Channels Routing Muskingum Method, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA etc. Concept of Correlogram.

Unit-III

System Analysis: Need, Water Resources Systems, Optimisation Techniques, Linear Programming, Feasible Solutions, Graphical Method, Simplex Method, Use of of LP in Water Resources, Introduction to Reservoir Operation, Rule curves, Linear Decision Rule

Unit-IV

Dynamic Programming, its utility in Resource Allocation and other Decision Making Problems, Optimal Operating, Policies, Use of D. P. in Reservoir, Operation.

Unit-V

Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

Course Outcome

CO1 llustrate Optimal Raingauge Network Design, Flood Frequency Analysis, Risk Analysis.
CO2 To understand Flood Management, Flood Routing through Reservoirs.
CO3 Analyze of System Analysis Graphical Method, Simplex Method, Use of of LP
CO4 To understand Dynamic Programming, its utility in Resource Allocation and other Decision Making Problems
CO5 llustrate Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

Reference Books:-

1. Loucks D.P., Stedinder l.R. & Haith D.A : Water Resources Systems Engg.
2. Kottegoda N. T., Stochastic Water Resources Technology.
3. Singh V.P. : Elementary Hydrology

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Elective-II BCE0652 Computational Methods in Structural Engineering

Course Contents

Course Objectives:

1. Introduce students to key numerical techniques used in structural analysis, such as finite element methods (FEM), boundary element methods, and finite difference methods.
2. each students how to apply computational algorithms to solve complex structural engineering problems, including static and dynamic analyses.
3. Encourage innovation by exploring current trends and advancements in computational methods within the field of structural engineering.
4. Develop skills to critically analyze results obtained from computational methods, ensuring accuracy and reliability.

Unit-I

Matrix formulation for the principle of virtual work and energy principles, principle of contra gradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations. Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beam column, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. Non prismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

Unit-II

Basics of the Direct Stiffness method - Analysis of pin jointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Non sway)

Unit-III

Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

Unit-IV

Analysis of continuum structures - Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalised element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

Unit-V

Two Dimensional Iso parametric elements, shape functions for Simplex. Lagrangian and Serendipidity family elements in natural coordinates, computation of stiffness matrix for iso parametric elements, degrading of elements, plate bending elements.

Course Outcome

CO1 To understand Matrix formulation for the principle of virtual work and energy principles.
CO2 To understand Basics of the Direct Stiffness method.
CO3 To understand Concepts of Bandwidth, various storage schemes & equation solvers.
CO4 Analyze of continuum structures.
CO5 Analyze of Two Dimensional Iso parametric elements.

Reference Books :-

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.
6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

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Elective – II BCE0653 Environmental Impact Assessment
Course Contents

Course Objectives:
1. be aware of basic life cycle methods as well as tools for evaluating environmental impact and making classifications of buildings;
2. have knowledge of the LCC analysis concept and how it can be used for optimisation;
3. have understanding of the LCA concept;
4. have knowledge of major environmental certification systems for buildings;
5. understand and be able to discuss different actors' needs and goals;

UNIT-I
Concept of EIA: Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

UNIT-II
Methods of Impact Identification : Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

UNIT-III
Impact analysis : Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

UNIT-IV
Preparation of written documentation : Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

UNIT-V
Public Participation in Environmental Decision making : Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

Course Outcome
CO1 To understand the concept of Environmental impact assessment.
CO2 Illustrate methods of impact identification, matrix methodologies.
CO3 To understand impact analysis of air, water and noise.
CO4 To analysis of preparation of written documentation, initial and detailed planning phase.

CO5 To understand public participation in environmental decision making and its implementation.

References Books:

1. Barrow, C.J. 2000. Social Impact Assessment: An Introduction. Oxford University Press.
2. Glasson, J., Therivel, R., Chadwick, A. 1994. Introduction to Environmental Impact Assessment. London, Research Press, UK.
3. Judith, P. 1999. Handbook of Environmental Impact Assessment. Blackwell Science.
4. Marriott, B. 1997. Environmental Impact Assessment: A Practical Guide. McGraw-Hill, New York, USA.
5. Westman W.E. 1985, Ecology, Impact Assessment and Environmental Planning, John Wiley, New York

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Elective – II BCE0654 Water shed Management

Course Contents

Course Objectives:
1. Grasp the physical, biological, and hydrological processes that occur within a watershed.
2. Learn methods for assessing watershed health and water quality, including monitoring and data analysis.
3. Understand the legal and regulatory frameworks governing watershed management at local, regional, and national levels.
4. Recognize the ecosystem services provided by watersheds and their importance to human communities and biodiversity

Unit-I
Soil and Water, Issues related to plant life like composition of soil, water requirement of crops, necessary conditions for plant growth etc. Soils, their origin and classification.

Unit-II
Land classification for WM, Land capability rating, determination of land capability class, land capability and suitability surveys.

Unit-III
 Soil erosion, problem, types, conservation, and control measures in agricultural and non-agricultural land. Water conservation and Harvesting, Agronomical measures in soil and water conservation. Examples and critical reviews.

Unit-IV
Watershed Management, Approach in Govt. programmers, people's participation, conservation farming, watershed-management planning, identification of problems, objectives and priorities, socioeconomic survey, use of tools like GIS.

Unit-V
Hill slope processes, forest and land use, hill slope conservation. Bad lands, bad land development.

Course Outcome
CO1 To understand Soil and Water Issues related to plant
CO2 To understand Land classification for WM, Land capability rating
CO3 To understand Soil erosion, problem.
CO4 To understand Watershed Management, Approach in Govt. programmers.

CO5 To understand Hill slope processes, forest and land use, hill slope conservation.

Reference Books :-

1) Name of Text Books: Watershed Management –J.V.S. Murthy (New Age International Ltd.)
2) Name of Reference Books: Watershed Management –B.M. Tideman Modern physical geography –Strahler A.N. and Strahler A.H.

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BCE062P Structural Design I (RCC) Lab

STAAD PRO

Chapter 1

Introduction to STRUCTURAL ENGINEERING
Introduction to STAAD.Pro.V8i
Getting familiar with STAAD window
Model generation using STAAD editor

Chapter 2

Introduction to Snap Node/Beam
Editor Model generation using Node/Beam Editor
Introduction to Translational Repeat
Model generation using Translational Repeat

Chapter 3

Assigning Properties
Assigning Supports
Assigning Loads
Structure Analysis

Chapter 4

Simply Supported Beam
Analysis of Framed Structure
Applying Floor Loads

Equipment/Machines/Instruments/Tools/Software Required:
1. Latest Release of Software Package STAAD Pro (Research Engineers International, Kolkata)
2. Latest Release of Software Package STAAD.etc (Research Engineers International, Kolkata)

Recommended Books:
1. Reference Manual for Respective Software
2. Verification Manual of Respective Software

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BCE063P Geotechnical Engineering-I Lab

LABORATORY WORK : Laboratory work will be based on the above course as required for soil investigators of engineering projects.

List of Experiments:
1. Determination of Hygroscopic water content
2. Particle - size analysis
3. Determination of Specific gravity of soil particles
4. Determination of plastic limit
5. Determination of liquid limit
6. Determination of shrinkage limit
7. Permeability tests
8. Direct shear test
9. Consolidation test

Reference Books: -
1. Soil Mechanics and Foundation Engineering – B.C. Punmia (Laxmi Publication)
2. Soil Engineering in Theory and Practice (Vol-II) –Alam Singh (Asia Publishing House, New Delhi)

BCE064P Transportation Engineering-II Lab

List of Experiments:
1. Collection of different types of photographs showing
   a. Various bridge types
   b. Rail tracks
   c. Tunnels
2. Hydraulic design of bridges.
3. Various modern large span bridges:
4. Pre stressed bridges and launching process.
5. Visit of Railway bridges for rehabilitation.
6. Visit of Railway Over Bridges and Under Bridges.

Reference Books: -
1. Highway Engineering – Justo & Khanna (Khanna Publishers)
2. Highway Engineering Manual – Justo & Khanna (Khanna Publishers)

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BCE066P Project Based on Field Visit & Training

Project Components:

1. **Field Visits:**
    - **Construction Sites:** Visit ongoing construction projects (e.g., buildings, bridges, roads).
        - **Activities:** Observe construction methods, materials used, and safety practices.
        - **Documentation:** Prepare a report on the construction techniques and challenges faced.
    - **Infrastructure Projects:** Explore local infrastructure projects (e.g., water treatment plants, highways).
        - **Activities:** Understand project planning, environmental considerations, and community impact.
        - **Documentation:** Write a reflective piece on the importance of infrastructure in community development.
2. **Workshops/Training Sessions:**
    - **Material Testing:** Organize sessions on testing civil engineering materials (concrete, soil, asphalt).
        - **Activities:** Perform tests (compressive strength, soil compaction, etc.) and analyze results.
    - **Surveying Techniques:** Conduct workshops on basic surveying equipment (theodolite, total station).
        - **Activities:** Hands-on training in measuring distances, angles, and creating site plans.
    - **Project Management Software:** Introduce software tools (e.g., MS Project, Primavera).
        - **Activities:** Training on planning, scheduling, and resource allocation for civil engineering projects.
3. **Group Project:**
    - **Project Proposal:** Students form groups to design a small-scale civil engineering project (e.g., a park, bridge).
        - **Tasks:** Conduct feasibility studies, prepare site plans, and budget estimates.
    - **Presentation:** Each group presents their project proposal to the class, simulating a real-world project pitch.
4. **Reflection and Feedback:**
    - **Reflective Journals:** Students maintain journals documenting their learning experiences during field visits and training.
    - **Feedback Session:** Conduct a class discussion to share insights and lessons learned from the project.

Evaluation Criteria:

- Participation in field visits and training sessions.
- Quality of reports and presentations.
- Collaboration and teamwork during the group project.
- Depth of reflection in journals.

Timeline:

- **Week 1-2:** Plan and schedule field visits and training sessions.
- **Week 3-4:** Conduct visits and workshops.
- **Week 5:** Group project work and preparation.
- **Week 6:** Presentations and feedback session.

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BCE067P Startup/Industrial Lectures

Course Objectives:
1. To expose students to real-world applications and trends in civil engineering.
2. To inspire entrepreneurial thinking and innovation in engineering practices.
3. To connect academic learning with industry needs and advancements.

Proposed Lecture Series:

Introduction to the Civil Engineering Industry

Speaker: Industry expert or professor.

Topics Covered:

Overview of the civil engineering field and career opportunities.

Current trends and future challenges in civil engineering.

Innovation in Construction Technologies

Speaker: Founder of a tech startup in construction.

Topics Covered:

Emerging technologies (e.g., BIM, 3D printing, drones).

Case studies on how startups are revolutionizing construction processes.

Sustainable Engineering Practices

Speaker: Environmental engineer or sustainability consultant.

Topics Covered:

Importance of sustainability in civil engineering.

Innovations in eco-friendly materials and practices.

Project Management in Civil Engineering

Speaker: Project manager from a leading construction firm.

Topics Covered:

Project lifecycle management and best practices.

Use of software tools for effective project management.

Startups in Infrastructure Development

Speaker: CEO of a startup focused on smart infrastructure.

Topics Covered:

Role of technology in improving infrastructure efficiency.

Challenges faced by startups in the civil engineering sector.

Financing and Investment in Civil Engineering Projects

Speaker: Financial analyst or venture capitalist.

Topics Covered:

Understanding funding options for civil engineering projects.

Importance of financial planning and risk management.

Case Studies of Successful Engineering Startups

Speaker: Founders of successful engineering startups.

Topics Covered:

Journey from concept to execution.
Lessons learned and advice for aspiring entrepreneurs.
Future Trends in Civil Engineering
Speaker: Academic researcher or industry analyst.
Topics Covered:
Predicting future trends and their implications for civil engineering.
The role of AI, IoT, and smart cities in shaping the industry.